



Mitsubishi Programmable Controller

MELSEC iQ-R
series

MELSEC iQ-R Temperature Control Module User's Manual (Startup)

- R60TCTRT2TT2
- R60TCTRT2TT2BW
- R60TCRT4
- R60TCRT4BW

SAFETY PRECAUTIONS

(Read these precautions before using this product.)

Before using this product, please read this manual and the relevant manuals carefully and pay full attention to safety to handle the product correctly.

The precautions given in this manual are concerned with this product only. For the safety precautions of the programmable controller system, refer to the MELSEC iQ-R Module Configuration Manual.

In this manual, the safety precautions are classified into two levels: " WARNING" and " CAUTION".

 WARNING	Indicates that incorrect handling may cause hazardous conditions, resulting in death or severe injury.
 CAUTION	Indicates that incorrect handling may cause hazardous conditions, resulting in minor or moderate injury or property damage.

Under some circumstances, failure to observe the precautions given under " CAUTION" may lead to serious consequences.

Observe the precautions of both levels because they are important for personal and system safety.

Make sure that the end users read this manual and then keep the manual in a safe place for future reference.

[Design Precautions]

WARNING

- Configure safety circuits external to the programmable controller to ensure that the entire system operates safely even when a fault occurs in the external power supply or the programmable controller. Failure to do so may result in an accident due to an incorrect output or malfunction.
 - (1) Emergency stop circuits, protection circuits, and protective interlock circuits for conflicting operations (such as forward/reverse rotations or upper/lower limit positioning) must be configured external to the programmable controller.
 - (2) When the programmable controller detects an abnormal condition, it stops the operation and all outputs are:
 - Turned off if the overcurrent or overvoltage protection of the power supply module is activated.
 - Held or turned off according to the parameter setting if the self-diagnostic function of the CPU module detects an error such as a watchdog timer error.
 - (3) All outputs may be turned on if an error occurs in a part, such as an I/O control part, where the CPU module cannot detect any error. To ensure safety operation in such a case, provide a safety mechanism or a fail-safe circuit external to the programmable controller. For a fail-safe circuit example, refer to "General Safety Requirements" in the MELSEC iQ-R Module Configuration Manual.
 - (4) Outputs may remain on or off due to a failure of a component such as a relay and transistor in an output circuit. Configure an external circuit for monitoring output signals that could cause a serious accident.
- In an output circuit, when a load current exceeding the rated current or an overcurrent caused by a load short-circuit flows for a long time, it may cause smoke and fire. To prevent this, configure an external safety circuit, such as a fuse.
- Configure a circuit so that the programmable controller is turned on first and then the external power supply. If the external power supply is turned on first, an accident may occur due to an incorrect output or malfunction.
- For the operating status of each station after a communication failure, refer to manuals relevant to the network. Incorrect output or malfunction due to a communication failure may result in an accident.
- When connecting an external device with a CPU module or intelligent function module to modify data of a running programmable controller, configure an interlock circuit in the program to ensure that the entire system will always operate safely. For other forms of control (such as program modification, parameter change, forced output, or operating status change) of a running programmable controller, read the relevant manuals carefully and ensure that the operation is safe before proceeding. Improper operation may damage machines or cause accidents.
- Especially, when a remote programmable controller is controlled by an external device, immediate action cannot be taken if a problem occurs in the programmable controller due to a communication failure. To prevent this, configure an interlock circuit in the program, and determine corrective actions to be taken between the external device and CPU module in case of a communication failure.
- Do not write any data to the "system area" and "write-protect area" of the buffer memory in the module. Also, do not use any "use prohibited" signals as an output signal from the CPU module to each module. Doing so may cause malfunction of the programmable controller system. For the "system area", "write-protect area", and the "use prohibited" signals, refer to the user's manual for the module used.

[Design Precautions]

WARNING

- If a communication cable is disconnected, the network may be unstable, resulting in a communication failure of multiple stations. Configure an interlock circuit in the program to ensure that the entire system will always operate safely even if communications fail. Failure to do so may result in an accident due to an incorrect output or malfunction.
- To maintain the safety of the programmable controller system against unauthorized access from external devices via the network, take appropriate measures. To maintain the safety against unauthorized access via the Internet, take measures such as installing a firewall.

[Design Precautions]

CAUTION

- Do not install the control lines or communication cables together with the main circuit lines or power cables. Keep a distance of 100mm or more between them. Failure to do so may result in malfunction due to noise.
- During control of an inductive load such as a lamp, heater, or solenoid valve, a large current (approximately ten times greater than normal) may flow when the output is turned from off to on. Therefore, use a module that has a sufficient current rating.
- After the CPU module is powered on or is reset, the time taken to enter the RUN status varies depending on the system configuration, parameter settings, and/or program size. Design circuits so that the entire system will always operate safely, regardless of the time.
- Do not power off the programmable controller or reset the CPU module while the settings are being written. Doing so will make the data in the flash ROM undefined. The values need to be set in the buffer memory and written to the flash ROM again. Doing so also may cause malfunction or failure of the module.
- When changing the operating status of the CPU module from external devices (such as the remote RUN/STOP functions), select "Do Not OPEN in Program" for "Open Method Setting" in the module parameters. If "OPEN in Program" is selected, an execution of the remote STOP function causes the communication line to close. Consequently, the CPU module cannot reopen the line, and external devices cannot execute the remote RUN function.

[Installation Precautions]

WARNING

- Shut off the external power supply (all phases) used in the system before mounting or removing the module. Failure to do so may result in electric shock or cause the module to fail or malfunction.

[Installation Precautions]

CAUTION

- Use the programmable controller in an environment that meets the general specifications in the Safety Guidelines included with the base unit. Failure to do so may result in electric shock, fire, malfunction, or damage to or deterioration of the product.
- To mount a module, place the concave part(s) located at the bottom onto the guide(s) of the base unit, and push in the module until the hook(s) located at the top snaps into place. Incorrect interconnection may cause malfunction, failure, or drop of the module.
- When using the programmable controller in an environment of frequent vibrations, fix the module with a screw.
- Tighten the screws within the specified torque range. Undertightening can cause drop of the screw, short circuit, or malfunction. Overtightening can damage the screw and/or module, resulting in drop, short circuit, or malfunction.
- When using an extension cable, connect it to the extension cable connector of the base unit securely. Check the connection for looseness. Poor contact may cause malfunction.
- When using an SD memory card, fully insert it into the SD memory card slot. Check that it is inserted completely. Poor contact may cause malfunction.
- Securely insert an extended SRAM cassette into the cassette connector of the CPU module. After insertion, close the cassette cover and check that the cassette is inserted completely. Poor contact may cause malfunction.
- Do not directly touch any conductive parts and electronic components of the module, SD memory card, extended SRAM cassette, or connector. Doing so can cause malfunction or failure of the module.

[Wiring Precautions]

WARNING

- Shut off the external power supply (all phases) used in the system before installation and wiring. Failure to do so may result in electric shock or cause the module to fail or malfunction.
- After installation and wiring, attach the included terminal cover to the module before turning it on for operation. Failure to do so may result in electric shock.

[Wiring Precautions]

CAUTION

- Individually ground the FG and LG terminals of the programmable controller with a ground resistance of 100 ohms or less. Failure to do so may result in electric shock or malfunction.
- Use applicable solderless terminals and tighten them within the specified torque range. If any spade solderless terminal is used, it may be disconnected when the terminal screw comes loose, resulting in failure.
- Check the rated voltage and signal layout before wiring to the module, and connect the cables correctly. Connecting a power supply with a different voltage rating or incorrect wiring may cause fire or failure.
- Connectors for external devices must be crimped or pressed with the tool specified by the manufacturer, or must be correctly soldered. Incomplete connections may cause short circuit, fire, or malfunction.
- Securely connect the connector to the module. Poor contact may cause malfunction.
- Do not install the control lines or communication cables together with the main circuit lines or power cables. Keep a distance of 100mm or more between them. Failure to do so may result in malfunction due to noise.
- Place the cables in a duct or clamp them. If not, dangling cable may swing or inadvertently be pulled, resulting in damage to the module or cables or malfunction due to poor contact. Do not clamp the extension cables with the jacket stripped.
- Check the interface type and correctly connect the cable. Incorrect wiring (connecting the cable to an incorrect interface) may cause failure of the module and external device.
- Tighten the terminal screws or connector screws within the specified torque range. Undertightening can cause drop of the screw, short circuit, fire, or malfunction. Overtightening can damage the screw and/or module, resulting in drop, short circuit, fire, or malfunction.
- When disconnecting the cable from the module, do not pull the cable by the cable part. For the cable with connector, hold the connector part of the cable. For the cable connected to the terminal block, loosen the terminal screw. Pulling the cable connected to the module may result in malfunction or damage to the module or cable.
- Prevent foreign matter such as dust or wire chips from entering the module. Such foreign matter can cause a fire, failure, or malfunction.
- A protective film is attached to the top of the module to prevent foreign matter, such as wire chips, from entering the module during wiring. Do not remove the film during wiring. Remove it for heat dissipation before system operation.
- Programmable controllers must be installed in control panels. Connect the main power supply to the power supply module in the control panel through a relay terminal block. Wiring and replacement of a power supply module must be performed by qualified maintenance personnel with knowledge of protection against electric shock. For wiring, refer to the MELSEC iQ-R Module Configuration Manual.
- For Ethernet cables to be used in the system, select the ones that meet the specifications in the user's manual for the module used. If not, normal data transmission is not guaranteed.

[Wiring Precautions]

CAUTION

- Individually ground the shielded cables of the programmable controller with a ground resistance of 100 ohms or less. Failure to do so may result in electric shock or malfunction.
-

[Startup and Maintenance Precautions]

WARNING

- Do not touch any terminal while power is on. Doing so will cause electric shock or malfunction.
 - Correctly connect the battery connector. Do not charge, disassemble, heat, short-circuit, solder, or throw the battery into the fire. Also, do not expose it to liquid or strong shock. Doing so will cause the battery to produce heat, explode, ignite, or leak, resulting in injury and fire.
 - Shut off the external power supply (all phases) used in the system before cleaning the module or retightening the terminal screws, connector screws, or module fixing screws. Failure to do so may result in electric shock.
-

[Startup and Maintenance Precautions]

CAUTION

- When connecting an external device with a CPU module or intelligent function module to modify data of a running programmable controller, configure an interlock circuit in the program to ensure that the entire system will always operate safely. For other forms of control (such as program modification, parameter change, forced output, or operating status change) of a running programmable controller, read the relevant manuals carefully and ensure that the operation is safe before proceeding. Improper operation may damage machines or cause accidents.
- Especially, when a remote programmable controller is controlled by an external device, immediate action cannot be taken if a problem occurs in the programmable controller due to a communication failure. To prevent this, configure an interlock circuit in the program, and determine corrective actions to be taken between the external device and CPU module in case of a communication failure.
- Do not disassemble or modify the modules. Doing so may cause failure, malfunction, injury, or a fire.
- Use any radio communication device such as a cellular phone or PHS (Personal Handy-phone System) more than 25cm away in all directions from the programmable controller. Failure to do so may cause malfunction.
- Shut off the external power supply (all phases) used in the system before mounting or removing the module. Failure to do so may cause the module to fail or malfunction.
- Tighten the screws within the specified torque range. Undertightening can cause drop of the component or wire, short circuit, or malfunction. Overtightening can damage the screw and/or module, resulting in drop, short circuit, or malfunction.
- After the first use of the product, do not mount/remove the module to/from the base unit, and the terminal block to/from the module, and do not insert/remove the extended SRAM cassette to/from the CPU module more than 50 times (IEC 61131-2 compliant) respectively. Exceeding the limit may cause malfunction.
- After the first use of the product, do not insert/remove the SD memory card to/from the CPU module more than 500 times. Exceeding the limit may cause malfunction.
- Do not touch the metal terminals on the back side of the SD memory card. Doing so may cause malfunction or failure of the module.
- Do not touch the integrated circuits on the circuit board of an extended SRAM cassette. Doing so may cause malfunction or failure of the module.
- Do not drop or apply shock to the battery to be installed in the module. Doing so may damage the battery, causing the battery fluid to leak inside the battery. If the battery is dropped or any shock is applied to it, dispose of it without using.
- Startup and maintenance of a control panel must be performed by qualified maintenance personnel with knowledge of protection against electric shock. Lock the control panel so that only qualified maintenance personnel can operate it.
- Before handling the module, touch a conducting object such as a grounded metal to discharge the static electricity from the human body. Failure to do so may cause the module to fail or malfunction.

[Operating Precautions]

CAUTION

- When changing data and operating status, and modifying program of the running programmable controller from an external device such as a personal computer connected to an intelligent function module, read relevant manuals carefully and ensure the safety before operation. Incorrect change or modification may cause system malfunction, damage to the machines, or accidents.
- Do not power off the programmable controller or reset the CPU module while the setting values in the buffer memory are being written to the flash ROM in the module. Doing so will make the data in the flash ROM undefined. The values need to be set in the buffer memory and written to the flash ROM again. Doing so can cause malfunction or failure of the module.

[Disposal Precautions]

CAUTION

- When disposing of this product, treat it as industrial waste.
- When disposing of batteries, separate them from other wastes according to the local regulations. For details on battery regulations in EU member states, refer to the MELSEC iQ-R Module Configuration Manual.

[Transportation Precautions]

CAUTION

- When transporting lithium batteries, follow the transportation regulations. For details on the regulated models, refer to the MELSEC iQ-R Module Configuration Manual.
- The halogens (such as fluorine, chlorine, bromine, and iodine), which are contained in a fumigant used for disinfection and pest control of wood packaging materials, may cause failure of the product. Prevent the entry of fumigant residues into the product or consider other methods (such as heat treatment) instead of fumigation. The disinfection and pest control measures must be applied to unprocessed raw wood.

CONDITIONS OF USE FOR THE PRODUCT

- (1) Mitsubishi programmable controller ("the PRODUCT") shall be used in conditions;
- i) where any problem, fault or failure occurring in the PRODUCT, if any, shall not lead to any major or serious accident; and
 - ii) where the backup and fail-safe function are systematically or automatically provided outside of the PRODUCT for the case of any problem, fault or failure occurring in the PRODUCT.

- (2) The PRODUCT has been designed and manufactured for the purpose of being used in general industries.

mitsubishi shall have no responsibility or liability (including, but not limited to any and all responsibility or liability based on contract, warranty, tort, product liability) for any injury or death to persons or loss or damage to property caused by the PRODUCT that are operated or used in application not intended or excluded by instructions, precautions, or warning contained in mitsubishi's user, instruction and/or safety manuals, technical bulletins and guidelines for the PRODUCT.

("Prohibited Application")

Prohibited Applications include, but not limited to, the use of the PRODUCT in:

- Nuclear Power Plants and any other power plants operated by Power companies, and/or any other cases in which the public could be affected if any problem or fault occurs in the PRODUCT.
- Railway companies or Public service purposes, and/or any other cases in which establishment of a special quality assurance system is required by the Purchaser or End User.
- Aircraft or Aerospace, Medical applications, Train equipment, transport equipment such as Elevator and Escalator, Incineration and Fuel devices, Vehicles, Manned transportation, Equipment for Recreation and Amusement, and Safety devices, handling of Nuclear or Hazardous Materials or Chemicals, Mining and Drilling, and/or other applications where there is a significant risk of injury to the public or property.

Notwithstanding the above, restrictions Mitsubishi may in its sole discretion, authorize use of the PRODUCT in one or more of the Prohibited Applications, provided that the usage of the PRODUCT is limited only for the specific applications agreed to by Mitsubishi and provided further that no special quality assurance or fail-safe, redundant or other safety features which exceed the general specifications of the PRODUCTS are required. For details, please contact the Mitsubishi representative in your region.

INTRODUCTION

Thank you for purchasing the Mitsubishi MELSEC iQ-R series programmable controllers.

This manual describes the performance specifications, procedures before operation, wiring, and operation examples of the relevant products listed below.

Before using this product, please read this manual and the relevant manuals carefully and develop familiarity with the functions and performance of the MELSEC iQ-R series programmable controller to handle the product correctly.

When applying the program and circuit examples provided in this manual to an actual system, ensure the applicability and confirm that it will not cause system control problems.

Please make sure that the end users read this manual.

Point

Unless otherwise specified, this manual provides program examples in which the I/O numbers of X/Y0 to X/YF are assigned to the temperature control module. Assign I/O numbers when applying the program examples to an actual system. For I/O number assignment, refer to the following.

 MELSEC iQ-R Module Configuration Manual

Relevant products

R60TCTRT2TT2, R60TCTRT2TT2BW, R60TCRT4, R60TCRT4BW

COMPLIANCE WITH EMC AND LOW VOLTAGE DIRECTIVES

Method of ensuring compliance

To ensure that Mitsubishi programmable controllers maintain EMC and Low Voltage Directives when incorporated into other machinery or equipment, certain measures may be necessary. Please refer to one of the following manuals.

-  MELSEC iQ-R Module Configuration Manual
-  Safety Guidelines (This manual is included with the base unit.)

The CE mark on the side of the programmable controller indicates compliance with EMC and Low Voltage Directives.

Additional measures

To ensure that this product maintains EMC and Low Voltage Directives, please refer to one of the following manuals.

-  MELSEC iQ-R Module Configuration Manual
-  Safety Guidelines (This manual is included with the base unit.)

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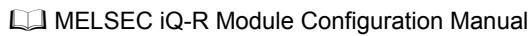
RELEVANT MANUALS

Manual name [manual number]	Description	Available form
MELSEC iQ-R Temperature Control Module User's Manual (Startup) [SH-081535ENG] (this manual)	Specifications, procedures before operation, wiring, and operation examples of the temperature control module	Print book e-Manual EPUB PDF
MELSEC iQ-R Temperature Control Module User's Manual (Application) [SH-081536ENG]	Functions, parameter settings, troubleshooting, I/O signals, and buffer memory of the temperature control module	Print book e-Manual EPUB PDF

This manual does not include detailed information on the following:

- General specifications
- Applicable CPU modules and the number of mountable modules
- Installation

For details, refer to the following.



This manual does not include information on the module function blocks.

For details, refer to the Function Block Reference for the module used.



e-Manual refers to the Mitsubishi FA electronic book manuals that can be browsed using a dedicated tool.

e-Manual has the following features:

- Required information can be cross-searched in multiple manuals.
- Other manuals can be accessed from the links in the manual.
- The hardware specifications of each part can be found from the product figures.
- Pages that users often browse can be bookmarked.

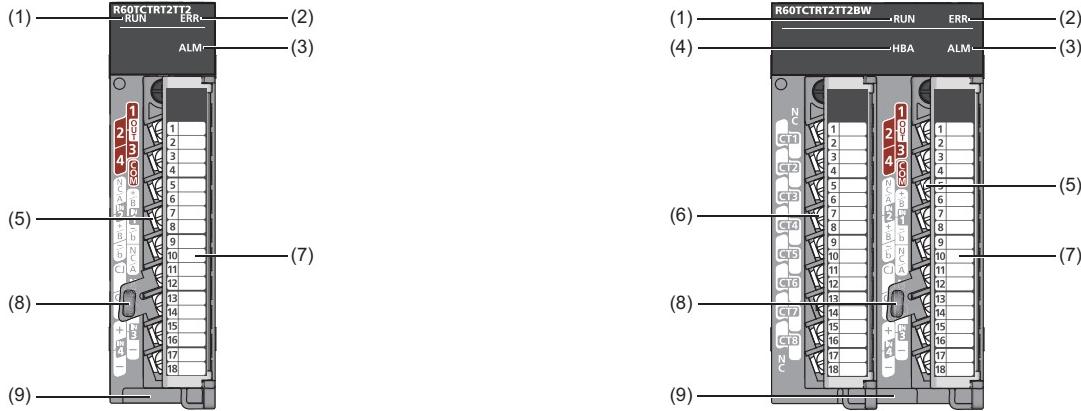
TERMS

Unless otherwise specified, this manual uses the following terms.

Term	Description
Buffer memory	The intelligent function module's memory where the data (such as setting values and monitored values) transferred from/to the CPU module is stored
Control method	The generic term of two-position control, P control, PI control, PD control, and PID control
Control mode	The generic term of standard control, heating-cooling control (normal mode), heating-cooling control (expanded mode), mix control (normal mode), mix control (expanded mode), position proportional control (normal mode), and position proportional control (expanded mode)
CPU module	The generic term of MELSEC iQ-R series CPU modules
Engineering tool	The product name of the MELSEC programmable controller software package
Fixed value action	The operating status of when a constant set value (SV) is kept
Global label	When multiple program data sets are created in a project, this label is valid for all the data sets. Global labels are classified into two types: Module-specific labels (module labels) that are automatically created by GX Works3 and labels that can be created for a specified device.
Module label	The memory areas that are defined by each module (I/O signals or buffer memory area) and expressed with character strings. GX Works3 automatically creates module labels from the module to be used. These labels can be used as global labels.
PID constants	The generic term of the proportional band (P), integral time (I), and derivative time (D)
Q compatible mode	The buffer memory map is converted into the one for the MELSEC-Q series to operate the module.
R mode	In this mode, the module operates with the buffer memory map that has been newly assigned for the MELSEC iQ-R series.
Ramp action	The operating status of when a set value (SV) always changes
Temperature sensor	The generic term of thermocouples and platinum resistance thermometers

1 PART NAMES

This chapter describes the part names of the temperature control module.



No.	Name	Description
(1)	RUN LED	Indicates the operating status of the temperature control module. On: The module is operating normally. Flashing: The module is selected as a module for the online module change. Off: 5V power off, watchdog timer error occurred, or module replacement is allowed in the process of the online module change
(2)	ERR LED	Indicates the error status of the temperature control module. On: An error has occurred. Off: The module is operating normally.
(3)	ALM LED	Indicates the alarm status of the temperature control module. On: An alert has occurred. Flashing: The temperature process value (PV) is out of the temperature measuring range, a loop disconnection is detected, or no temperature sensor is connected. Off: No alert has occurred.
(4)	HBA LED	Indicates the heater disconnection detection status or the output off-time current error status of the R60TCTRT2TT2BW and R60TCRT4BW. On: The heater disconnection status or the output off-time current error is detected. Off: The heater disconnection or the output off-time current error is not detected.
(5)	Terminal block for I/O	Used for temperature sensor input and transistor output.
(6)	Terminal block for CT	Used for current sensor (CT) input.
(7)	Terminal block cover	Prevents electric shock when current is applied.
(8)	Cold junction temperature compensation resistor	Used when cold junction temperature compensation is executed for the R60TCTRT2TT2 and R60TCTRT2TT2BW.
(9)	Production information marking	Displays the module production information (16 digits).

MEMO

2 SPECIFICATIONS

This chapter describes the performance specifications.

2.1 Performance Specifications

2

The following table lists the performance specifications of the temperature control module.

Item	R60TCTRT2TT2	R60TCRT4	R60TCTRT2TT2BW	R60TCRT4BW				
Control output	Transistor output							
Number of temperature input points	4 channels/module							
Applicable thermocouple/platinum resistance thermometer	Refer to the following. ☞ Page 19 Type of Temperature Sensors, Temperature Measuring Range, Resolution, and Effect from Wiring Resistance							
Accuracy ^{*1}	Indication accuracy	Ambient temperature: $25 \pm 5^{\circ}\text{C}$	Full scale $\times (\pm 0.3\%)$					
		Ambient temperature: 0 to 55°C	Full scale $\times (\pm 0.7\%)$					
Cold junction temperature compensation accuracy (Ambient temperature: 0 to 55°C)	Temperature process value: -100°C or higher	Within $\pm 1.0^{\circ}\text{C}$	—	Within $\pm 1.0^{\circ}\text{C}$				
	Temperature process value: -150 to -100°C	Within $\pm 2.0^{\circ}\text{C}$		Within $\pm 2.0^{\circ}\text{C}$				
	Temperature process value: -200 to -150°C	Within $\pm 3.0^{\circ}\text{C}$		Within $\pm 3.0^{\circ}\text{C}$				
Sampling cycle	Switchable between 250ms/4 channels and 500ms/4 channels							
Control output cycle	0.5 to 100.0s							
Input impedance	$1\text{M}\Omega$							
Input filter	0 to 100s (0: Input filter OFF)							
Sensor correction value setting	<ul style="list-style-type: none"> ■ When the R mode is used (-full scale of input range) to full scale of input range ■ When the Q compatible mode function is used -50.00 to 50.00% 							
Operation at a sensor input disconnection	Upscale processing							
Temperature control method	PID ON/OFF pulse or two-position control							
PID constants range	PID constants setting	Setting by auto tuning is available.						
	Proportional band (P)	<ul style="list-style-type: none"> ■ When the R mode is used 0 (0.0) to full scale of input range (depending on the decimal point position) (0: Two-position control) ■ When the Q compatible mode function is used 0.0 to 1000.0% (0: Two-position control) 						
	Integral time (I)	0 to 3600s (Set 0 for P control and PD control.)						
Derivative time (D)		0 to 3600s (Set 0 for P control and PI control.)						
Set value setting range	Within the temperature range set in the thermocouple/platinum resistance thermometer to be used							
Dead band setting range	<ul style="list-style-type: none"> ■ When the R mode is used 0 (0.0) to full scale of input range (depending on the decimal point position) ■ When the Q compatible mode function is used 0.1 to 10.0% 							
Transistor output	Output signal	ON/OFF pulse						
	Rated load voltage	10 to 30VDC						
	Maximum load current	0.1A/point, 0.4A/common						
	Maximum inrush current	0.4A, 10ms						
	Leakage current at OFF	0.1mA or lower						
	Maximum voltage drop at ON	1.0VDC (TYP) 0.1A, 2.5VDC (MAX) 0.1A						
	Response time	OFF→ON: 2ms or less, ON→OFF: 2ms or less						
Number of accesses to non-volatile memory	10^{12} times maximum							
Insulation method	Between the input terminal and PLC power supply: Transformer Between input channels: Transformer							

Item	R60TCTRT2TT2	R60TCRT4	R60TCTRT2TT2BW	R60TCRT4BW
Withstand voltage	Between input terminals and programmable controller power supply: 500VAC, 1 minute Between input channels: 500VAC, 1 minute			
Insulation resistance	Between input terminals and programmable controller power supply: 500VDC, 20MΩ or higher Between input channels: 500VDC, 20MΩ or higher			
Heater disconnection detection specifications	Current sensor	—	Refer to the following.  Page 26 Current sensor for heater disconnection detection	
	Input accuracy		Full scale × (±1.0%)	
	Number of alert delay		3 to 255 times	
Number of occupied I/O points	16 points, 1 slot (I/O assignment: intelligent 16 points)	32 points, 2 slots (I/O assignment: empty 16 points + intelligent 16 points)		
External connection system	18-point terminal block	18-point terminal block × 2		
Applicable wire size	0.3 to 0.75mm ² (22 to 18 AWG)			
Applicable solderless terminal	R1.25-3 (The solderless terminal with an insulation sleeve cannot be used.)			
Internal current consumption	0.28A	0.31A		
Weight	0.22kg	0.34kg		
External dimensions	Height	106mm (Base unit mounting part: 98mm)	106mm (Base unit mounting part: 98mm)	
	Width	27.8mm	56mm	
	Depth	110mm	110mm	

*1 Except for the conditions under noise influence

For the noise immunity, withstand voltage, insulation resistance, and others in a programmable controller system which uses a temperature control module, refer to the following.

 MELSEC iQ-R Module Configuration Manual

How to calculate the accuracy

Calculate the accuracy in the following method.

Accuracy (°C) = full scale × indication accuracy + cold junction temperature compensation accuracy

Ex.

Accuracy at the input range set to "38: Thermocouple K Measured Temperature Range (-200.0 to 400.0°C)", operating ambient temperature of 35°C, and the temperature process value (PV) of 300°C

(full scale) × (indication accuracy) + (cold junction temperature compensation accuracy)

$$= (400.0^{\circ}\text{C} - (-200.0^{\circ}\text{C})) \times (\pm 0.007) + (\pm 1.0^{\circ}\text{C})$$

$$= \pm 5.2^{\circ}\text{C}$$

2.2 Type of Temperature Sensors, Temperature Measuring Range, Resolution, and Effect from Wiring Resistance

This section describes the types of temperature sensors that can be used with the temperature control module, the temperature measuring range, the resolution, and the effect from wiring resistance of 1Ω

Thermocouple

The following table lists the types of thermocouples that can be used with the R60TCTRT2TT2 and R60TCTRT2TT2BW, the temperature measuring range, the resolution, and the effect from wiring resistance of 1Ω .

Thermocouple type	°C			°F		
	Temperature measuring range	Resolution	Effect from wiring resistance of 1Ω ($^{\circ}\text{C}/\Omega$) ^{*1}	Temperature measuring range	Resolution	Effect from wiring resistance of 1Ω ($^{\circ}\text{F}/\Omega$) ^{*1}
R	0 to 1700	1	0.030	0 to 3000	1	0.054
K	0 to 500 0 to 800 0 to 1300	1	0.005	0 to 1000 0 to 2400	1	0.008
	-200.0 to 400.0 0.0 to 400.0 0.0 to 500.0 0.0 to 800.0 -200.0 to 1300.0	0.1		0.0 to 1000.0	0.1	
J	0 to 500 0 to 800 0 to 1200	1	0.003	0 to 1000 0 to 1600 0 to 2100	1	0.006
	0.0 to 400.0 0.0 to 500.0 0.0 to 800.0 -200.0 to 1000.0	0.1		0.0 to 1000.0	0.1	
T	-200 to 400 -200 to 200 0 to 200 0 to 400	1	0.004	0 to 700 -300 to 400	1	0.008
	-200.0 to 400.0 0.0 to 400.0	0.1		0.0 to 700.0	0.1	
S	0 to 1700	1	0.030	0 to 3000	1	0.054
B	0 to 1800 ^{*2}	1	0.038	0 to 3000 ^{*2}	1	0.068
E	0 to 400 0 to 1000	1	0.003	0 to 1800	1	0.005
	0.0 to 700.0 -200.0 to 1000.0	0.1		—	—	
N	0 to 1300	1	0.006	0 to 2300	1	0.011
	0.0 to 1000.0	0.1		—	—	
U	0 to 400 -200 to 200	1	0.004	0 to 700 -300 to 400	1	0.009
	0.0 to 600.0	0.1		—	—	
L	0 to 400 0 to 900	1	0.003	0 to 800 0 to 1600	1	0.006
	0.0 to 400.0 0.0 to 900.0	0.1		—	—	
PLII	0 to 1200	1	0.005	0 to 2300	1	0.010
W5Re/W26Re	0 to 2300	1	0.017	0 to 3000	1	0.021

*1 Means temperature error per Ω of wiring resistance of the thermocouple. The error varies depending on measured temperature or ambient temperature. The temperature error can be corrected by the sensor correction function. (MELSEC iQ-R Temperature Control Module User's Manual (Application))

*2 Although a temperature lower than 400°C or lower than 800°F can be measured, the accuracy cannot be guaranteed.

Platinum resistance thermometer

The following table lists the types of platinum resistance thermometers that can be used with the temperature control module and the temperature measuring range.

Platinum resistance thermometer type	°C		°F	
	Temperature measuring range	Resolution	Temperature measuring range	Resolution
Pt100	-200.0 to 600.0	0.1	-300 to 1100	1
	-200.0 to 200.0 -200.0 to 850.0		-300.0 to 300.0	0.1
JPt100	-200.0 to 500.0	0.1	-300 to 900	1
	-200.0 to 200.0 -200.0 to 640.0		-300.0 to 300.0	0.1



For the R60TCTRT2TT2 and R60TCTRT2TT2BW, only CH1 and CH2 can be used.

3 FUNCTION LIST

The following table lists the functions of the temperature control module. For details on each function, refer to the following.

MELSEC iQ-R Temperature Control Module User's Manual (Application)

○: Available, ×: Not available

Item	Description	Availability		
		Standard control	Heating-cooling control	Position proportional control
Control mode selection function	A control mode can be selected from the following modes. <ul style="list-style-type: none">• Standard control• Heating-cooling control (normal mode)• Heating-cooling control (expanded mode)• Mix control (normal mode)• Mix control (expanded mode)• Position proportional control (normal mode)• Position proportional control (expanded mode)	○	○	○
Control method	By the settings of proportional band (P), integral time (I), and derivative time (D), each control method can be performed	○	○	○
		○	○	×
		○	○	○
		○	○	×
		○	○	○
Sampling cycle switching function	A sampling cycle can be selected from the following. <ul style="list-style-type: none">• 500ms• 250ms	○	○	○
HOLD/CLEAR function	Whether to clear or hold the transistor output status when a CPU module stop error occurs or when a CPU module is turned from RUN to STOP can be selected.	○	○	○
Overlap/dead band function	By changing the temperature where the cooling transistor output is started, whether control stability is prioritized or energy saving is prioritized can be selected.	×	○	×
Manual reset function	This function is used to manually move a stable position in the P control or PD control.	○	○	×
Cooling method setting function	At the execution of auto tuning, an auto tuning operational expression is automatically selected according to a selected cooling method and an operation is started.	×	○	×
Temperature conversion function (using unused channels)	In the heating-cooling control (normal mode), mix control (normal mode), or position proportional control (normal mode), only the temperature measurement can be performed using unused temperature input terminals.	×	○	○
Manual control	A manipulated value (MV) can be set manually by users without being automatically calculated by the PID control.	○	○	×
Auto tuning function	The temperature control module automatically sets suitable PID constants.	○	○	○
Self-tuning function	The temperature control module constantly monitors the control state. When the control system is oscillatory just after the control start, owing to the set value (SV) change or fluctuation of characteristics of a controlled object, this function allows PID constants to be automatically changed.	○	×	×
Direct/reverse action selection function	Whether to execute a PID operation with a direct action or a reverse action can be selected.	○	×	○
RFB limiter function	When deviation (E) continues for a long period of time, this function prevents the PID operation results (manipulated value (MV)) calculated by integral actions from exceeding the effective range of the manipulated value (MV).	○	○	○

Item	Description	Availability		
		Standard control	Heating-cooling control	Position proportional control
Derivative action selection function	This function improves dynamic characteristics by selecting a suitable derivative action for fixed value actions or ramp actions.	○	○	×
Simple two-degree-of-freedom	In addition to the PID control, this function selects a suitable response speed for the set value (SV) change from three levels to simply achieve the two-degree-of-freedom PID control.	○	○	○
Auto-setting at input range change	When the input range is changed, the related buffer memory data is automatically changed to prevent the values in those buffer memory areas from being out of the setting range.	○	○	○
Setting variation rate limiter setting function	Setting change rate limiters for the temperature rise and the temperature drop can be set in a batch or individually.	○	○	○
Sensor correction function	When there is an error between the temperature process value (PV) and actual temperature due to measurement conditions, this function corrects the error. Select one of the following two correction methods. <ul style="list-style-type: none">• Normal sensor correction (one-point correction) function: Corrects the error using a set value as the error correction value.• Sensor two-point correction function: Sets two points (correction offset value, correction gain value) to correct the error.	○	○	○
Primary delay digital filter	By setting the primary delay digital filter, a temperature process value (PV) with smoothed transient noise can be output.	○	○	○
Moving average processing	Moving average processing can be set to a temperature process value (PV). With this function, the fluctuation of temperature process values (PV) can be reduced in electrically noisy environments or in the environments where temperature process values (PV) fluctuate greatly. The moving average processing can be disabled to hasten the response to the change of temperature process values (PV).	○	○	○
Scaling function	This function can convert temperature process values (PV) into the set width to import them in the buffer memory.	○	○	○
ON delay output function	This function enables users to configure settings considering the delay time (response/scan time delay) of an actual transistor output.	○	○	○
Input/output (with another analog module) function	This function can input and output with other analog modules (including A/D converter module and D/A converter module) on the system. The position proportional control can use input only.	○	○	○
Alert function	This function issues an alert when a temperature process value (PV) or deviation (E) meets the condition set in advance.	○	○	○
Heater disconnection detection function	The current which flows in the heater main circuit can be measured and disconnections can be detected.	○	○	×
Output off-time current error detection function	An error of when the transistor output is off can be detected.	○	○	×
Loop disconnection detection function	The current which flows in the heater main circuit can be measured and disconnections can be detected.	○	×	×
Loop disconnection detection during AT function	This function detects loop disconnections during AT (auto tuning).	○	×	×
Peak current suppression function	This function suppresses the peak current by automatically changing the values of the upper limit output limiter of each channel and dividing the timing of the transistor output.	○	×	×
Simultaneous temperature rise function	This function allows several loops to reach the set value (SV) at the same time.	○	×	×

Item	Description	Availability		
		Standard control	Heating-cooling control	Position proportional control
Inter-module link function	Inter-module peak current suppression function	○	×	×
	Inter-module simultaneous temperature rise function	○	×	×
Disturbance suppression function	This function quickly damps the temperature change caused by disturbance.	○	○	×
Buffer memory data backup function	A set value in a buffer memory area can be backed up in the non-volatile memory.	○	○	○
Overshoot control function	This function controls the overshoot at start-up and at set value (SV) change. This function and setting of control response parameter allow high-speed temperature rise.	○	○	○
Error history function	Up to 16 errors and alarms that occur in the temperature control module are stored in the buffer memory as history.	○	○	○
Event history function	The errors or alarms occurred and operations executed on the temperature control module are collected as event information into the CPU module.	○	○	○
Interrupt function	This function starts an interrupt program of the CPU module when an interrupt factor such as alarm output is detected.	○	○	○
Online module change	This function allows users to change a module without stopping the system. For the procedure of the online module change, refer to the following.  MELSEC iQ-R Online Module Change Manual	○	○	○
Q compatible mode function	This function arranges the buffer memory addresses of the temperature control module to become equivalent to the ones of a MELSEC-Q series module. Programs proven with the MELSEC-Q series module can be used.	○	○	○

4 PROCEDURES BEFORE OPERATION

This chapter describes the procedures before operation.

1. Mounting modules

Mount the temperature control module in a desired configuration.

☞ Page 26 SYSTEM CONFIGURATION

2. Wiring

Wire external devices to the temperature control module.

☞ Page 28 INSTALLATION AND WIRING

3. Addition of modules

Use an engineering tool to add the temperature control module to the module configuration. For details, refer to the following.

BOOK GX Works3 Operating Manual

4. Setting parameters

Use an engineering tool to set the parameters of the temperature control module. For details, refer to the following.

BOOK MELSEC iQ-R Temperature Control Module User's Manual (Application)

5. Execution of auto tuning

To execute the auto tuning, set PID constants with the auto tuning function. For details, refer to the following.

BOOK MELSEC iQ-R Temperature Control Module User's Manual (Application)

When using the R60TCTRT2TT2 or R60TCTRT2TT2BW, execute a warm-up operation for about 15 minutes before operation.

6. Programming

Create a program. For details, refer to the following.

☞ Page 49 OPERATION EXAMPLES

7. Warm-up operation

When using the R60TCTRT2TT2 or R60TCTRT2TT2BW, execute a warm-up operation for about 15 minutes before operation.

MEMO

4

5 SYSTEM CONFIGURATION

Temperature sensor

For usable temperature sensors, refer to the following.

☞ Page 19 Type of Temperature Sensors, Temperature Measuring Range, Resolution, and Effect from Wiring Resistance

Current sensor for heater disconnection detection

The following table lists current sensors for heater disconnection detection available with the R60TCTRT2TT2BW or R60TCRT4BW.

Model	Manufacturer
CTL-12-S36-10 (0.0 to 100.0A)	U.R.D.Co., LTD.
CTL-12-S56-10 (0.0 to 100.0A)	
CTL-6-P-H (0.00 to 20.00A)	
CTL-6-S-H (0.00 to 20.00A)	
CTL-12L-8 (0.0 to 100.0A)	

For how to select current sensors for heater disconnection detection, refer to the following.

☞ MELSEC iQ-R Temperature Control Module User's Manual (Application)

5.1 Precautions for System Configuration

The R60TCTRT2TT2 and R60TCTRT2TT2BW measure temperatures based on the temperature of the terminal block. Thus, depending on the system configuration used (especially when two or more of the R60TCTRT2TT2 and R60TCTRT2TT2BW modules are connected next to each other, or the R60TCTRT2TT2 or R60TCTRT2TT2BW is mounted next to the power supply module or CPU module), the temperature distribution of the terminal block is not uniform due to the effects of heat generated from modules, and the measured temperature may greatly differ from the actual temperature.

In this case, the error between the measured value and actual temperature can be corrected by the following methods.

Using the sensor correction function

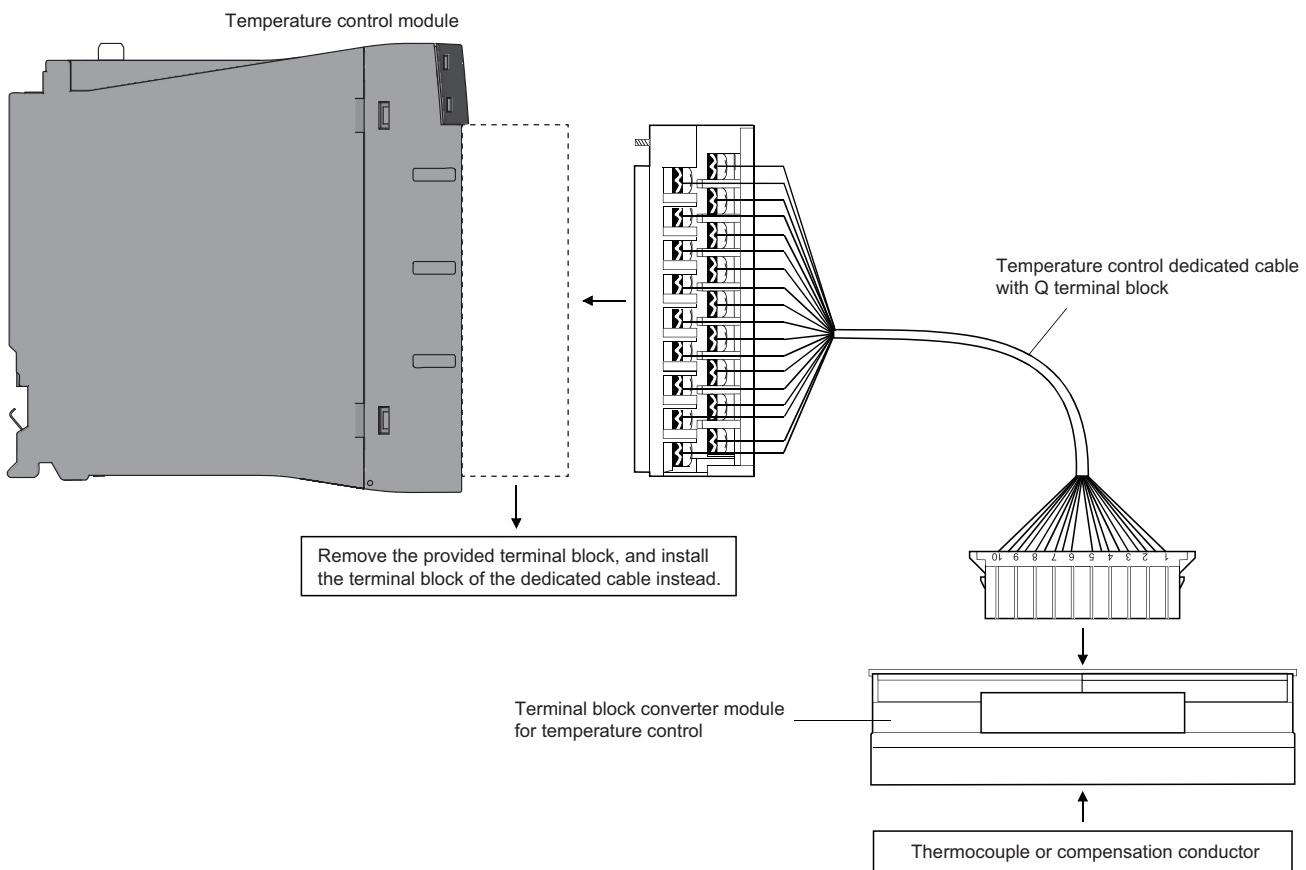
The measured temperature can be corrected to the actual temperature with this function. For details on the sensor correction function, refer to the following.

☞ MELSEC iQ-R Temperature Control Module User's Manual (Application)

Using terminal block converter module and dedicated cables

The temperature control module measures temperatures based on the temperature of the terminal block. Thus, depending on the system configuration used, the temperature distribution of the terminal block is not uniform due to the effects of heat generated from modules, and the measured temperature may greatly differ from the actual temperature. (especially when two or more temperature control modules are connected next to each other or the temperature control module is mounted next to the power supply module or CPU module).

In such cases, using the following terminal block converter module and dedicated cables reduces an error caused by the heat generated.



Item	Model	Manufacturer
Temperature control dedicated cable with Q terminal block	FA-CBLQ64TC** (**: Cable length)	Your local Mitsubishi Electric sales office or representative
Terminal block converter module for temperature control	FA-TB20TC	

6 INSTALLATION AND WIRING

This chapter describes the installation and wiring of the temperature control module.

6.1 Terminal Block

Precautions

Tighten the terminal block screws within the following specified tightening torque range.

Undertightening can cause drop of the screw, short circuit, or malfunction. Overtightening can damage the screw and/or module, resulting in drop, short circuit, or malfunction.

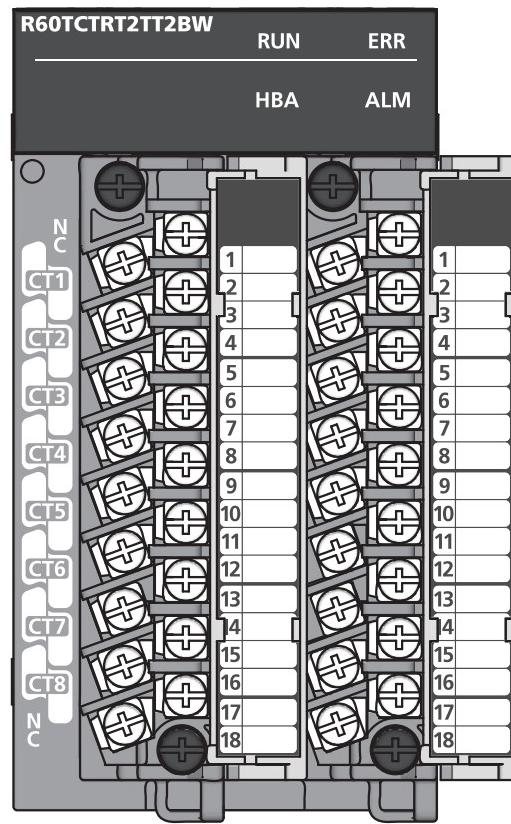
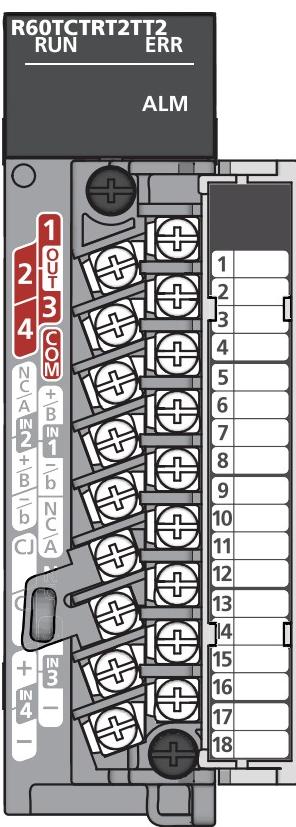
Screw	Tightening torque range
Terminal screw (M3 screw)	0.42 to 0.58N·m
Terminal block mounting screw (M3.5 screw)	0.66 to 0.89N·m

The following table shows the applicable solderless terminal installed to the terminal block. For wiring, use the wire applicable to the following wire and mount with the applicable tightening torque. Use a UL-approved solderless terminal and tools recommended by the manufacturer of the solderless terminal. The solderless terminal with an insulation sleeve cannot be used.

Solderless terminal		Wire			
Model	Applicable tightening torque	Wire diameter	Type	Material	Temperature rating
R1.25-3	0.42 to 0.58N·m	22 to 18 AWG	Stranded wire	Copper wire	75°C

Signal names of terminal blocks

■R60TCTRT2TT2 and R60TCTRT2TT2BW (Terminal block for I/O)



- Standard control, heating-cooling control (normal mode), mix control (normal mode), and position proportional control (normal mode)

Terminal No.	Standard control		Heating-cooling control (normal mode)		Mix control (normal mode)		Position proportional control (normal mode)	
	Symbol	Name	Symbol	Name	Symbol	Name	Symbol	Name
1	L1	CH1 Output	L1H	CH1 Heating output	L1H	CH1 Heating output	CH1 OPEN	CH1 Open output
2	L2	CH2 Output	L1C	CH1 Cooling output	L1C	CH1 Cooling output	CH1 CLOSE	CH1 Close output
3	L3	CH3 Output	L2H	CH2 Heating output	L3	CH3 Output	CH2 OPEN	CH2 Open output
4	L4	CH4 Output	L2C	CH2 Cooling output	L4	CH4 Output	CH2 CLOSE	CH2 Close output
5	COM-	Output common	COM-	Output common	COM-	Output common	COM-	Output common
6	NC/ CH2A	Not used/CH2 Resistance thermometer A	NC/ CH2A	Not used/CH2 Resistance thermometer A	NC/ MT2A	Not used/Monitor resistance thermometer A	NC/ CH2A	Not used/CH2 Resistance thermometer A
7	CH1+/ CH1B	CH1 Thermocouple +/CH1 Resistance thermometer B	CH1+/ CH1B	CH1 Thermocouple +/CH1 Resistance thermometer B	CH1+/ CH1B	CH1 Thermocouple +/CH1 Resistance thermometer B	CH1+/ CH1B	CH1 Thermocouple +/CH1 Resistance thermometer B
8	CH2+/ CH2B	CH2 Thermocouple +/CH2 Resistance thermometer B	CH2+/ CH2B	CH2 Thermocouple +/CH2 Resistance thermometer B	MT2+/ MT2B	Monitor 2 thermocouple +/ Monitor resistance thermometer B	CH2+/ CH2B	CH2 Thermocouple +/CH2 Resistance thermometer B
9	CH1-/ CH1b	CH1 Thermocouple -/CH1 Resistance thermometer b	CH1-/ CH1b	CH1 Thermocouple -/CH1 Resistance thermometer b	CH1-/ CH1b	CH1 Thermocouple -/CH1 Resistance thermometer b	CH1-/ CH1b	CH1 Thermocouple -/CH1 Resistance thermometer b

Terminal No.	Standard control		Heating-cooling control (normal mode)		Mix control (normal mode)		Position proportional control (normal mode)	
	Symbol	Name	Symbol	Name	Symbol	Name	Symbol	Name
10	CH2-/CH2b	CH2 Thermocouple -/CH2 Resistance thermometer b	CH2-/CH2b	CH2 Thermocouple -/CH2 Resistance thermometer b	MT2-/MT2b	Monitor 2 thermocouple-/Monitor resistance thermometer b	CH2-/CH2b	CH2 Thermocouple -/CH2 Resistance thermometer b
11	NC/CH1A	Not used/CH1 Resistance thermometer A	NC/CH1A	Not used/CH1 Resistance thermometer A	NC/CH1A	Not used/CH1 Resistance thermometer A	NC/CH1A	Not used/CH1 Resistance thermometer A
12	CJ	Cold junction temperature compensation resistor	CJ	Cold junction temperature compensation resistor	CJ	Cold junction temperature compensation resistor	CJ	Cold junction temperature compensation resistor
13	NC	Not used	NC	Not used	NC	Not used	NC	Not used
14	CJ	Cold junction temperature compensation resistor	CJ	Cold junction temperature compensation resistor	CJ	Cold junction temperature compensation resistor	CJ	Cold junction temperature compensation resistor
15	CH3+	CH3 Thermocouple +	MT3+	Monitor 3 thermocouple +	CH3+	CH3 Thermocouple +	MT3+	Monitor 3 thermocouple +
16	CH4+	CH4 Thermocouple +	MT4+	Monitor 4 thermocouple +	CH4+	CH4 Thermocouple +	MT4+	Monitor 4 thermocouple +
17	CH3-	CH3 Thermocouple -	MT3-	Monitor 3 thermocouple -	CH3-	CH3 Thermocouple -	MT3-	Monitor 3 thermocouple -
18	CH4-	CH4 Thermocouple -	MT4-	Monitor 4 thermocouple -	CH4-	CH4 Thermocouple -	MT4-	Monitor 4 thermocouple -

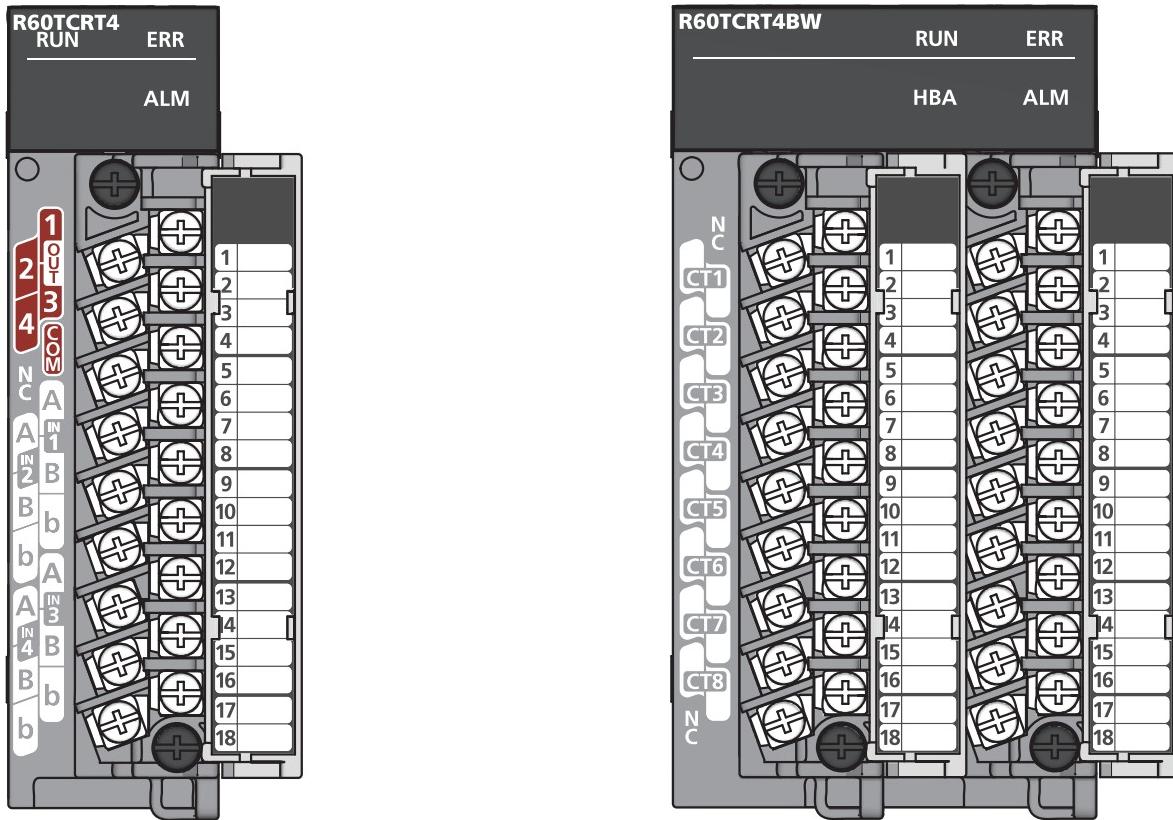
- Heating-cooling control (expanded mode), mix control (expanded mode), and position proportional control (expanded mode)

Terminal No.	Heating-cooling control (expanded mode)		Mix control (expanded mode)		Position proportional control (expanded mode)	
	Symbol	Name	Symbol	Name	Symbol	Name
1	L1H	CH1 Heating output	L1H	CH1 Heating output	CH1 OPEN	CH1 Open output
2	L1C	CH1 Cooling output	L1C	CH1 Cooling output	CH1 CLOSE	CH1 Close output
3	L2H	CH2 Heating output	L3	CH3 Output	CH2 OPEN	CH2 Open output
4	L2C	CH2 Cooling output	L4	CH4 Output	CH2 CLOSE	CH2 Close output
5	COM-	Output common	COM-	Output common	COM-	Output common
6	NC/ CH2A	Not used/CH2 Resistance thermometer A	NC/ CH2A	Not used/CH2 Resistance thermometer A	NC/ CH2A	Not used/CH2 Resistance thermometer A
7	CH1+/ CH1B	CH1 Thermocouple +/CH1 Resistance thermometer B	CH1+/ CH1B	CH1 Thermocouple +/CH1 Resistance thermometer B	CH1+/ CH1B	CH1 Thermocouple +/CH1 Resistance thermometer B
8	CH2+/ CH2B	CH2 Thermocouple +/CH2 Resistance thermometer B	CH2+/ CH2B	CH2 Thermocouple +/CH2 Resistance thermometer B	CH2+/ CH2B	CH2 Thermocouple +/CH2 Resistance thermometer B
9	CH1-/ CH1b	CH1 Thermocouple -/CH1 Resistance thermometer b	CH1-/ CH1b	CH1 Thermocouple -/CH1 Resistance thermometer b	CH1-/ CH1b	CH1 Thermocouple -/CH1 Resistance thermometer b
10	CH2-/ CH2b	CH2 Thermocouple -/CH2 Resistance thermometer b	CH2-/ CH2b	CH2 Thermocouple -/CH2 Resistance thermometer b	CH2-/ CH2b	CH2 Thermocouple -/CH2 Resistance thermometer b
11	NC/ CH1A	Not used/CH1 Resistance thermometer A	NC/ CH1A	Not used/CH1 Resistance thermometer A	NC	Not used
12	CJ	Cold junction temperature compensation resistor	CJ	Cold junction temperature compensation resistor	CJ	Cold junction temperature compensation resistor
13	NC	Not used	NC	Not used	NC	Not used
14	CJ	Cold junction temperature compensation resistor	CJ	Cold junction temperature compensation resistor	CJ	Cold junction temperature compensation resistor
15	CH3+	CH3 Thermocouple +	CH3+	CH3 Thermocouple +	CH3+	CH3 Thermocouple +
16	CH4+	CH4 Thermocouple +	CH4+	CH4 Thermocouple +	CH4+	CH4 Thermocouple +
17	CH3-	CH3 Thermocouple -	CH3-	CH3 Thermocouple -	CH3-	CH3 Thermocouple -
18	CH4-	CH4 Thermocouple -	CH4-	CH4 Thermocouple -	CH4-	CH4 Thermocouple -



Do not remove the cold junction temperature compensation resistor from the terminal block.

■R60TCRT4 and R60TCRT4BW (Terminal block for I/O)



- Standard control, heating-cooling control (normal mode), mix control (normal mode), and position proportional control (normal mode)

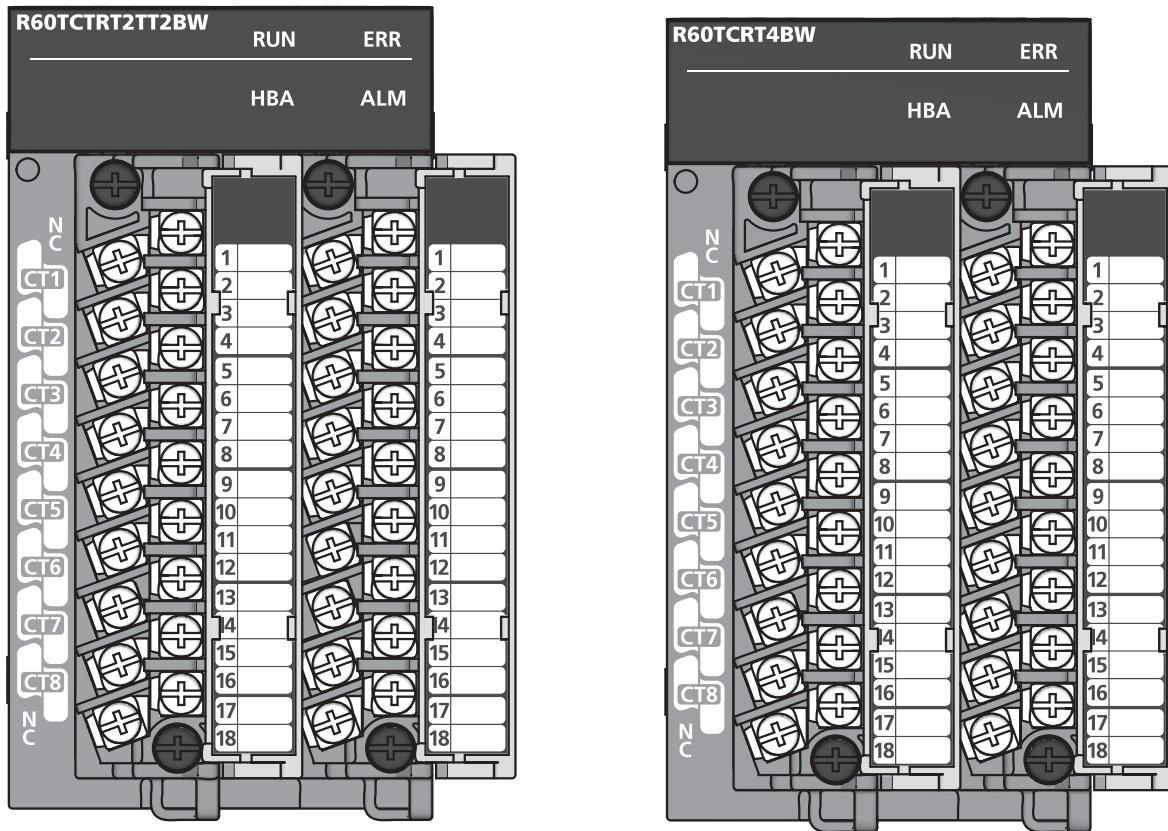
Terminal No.	Standard control		Heating-cooling control (normal mode)		Mix control (normal mode)		Position proportional control (normal mode)	
	Symbol	Name	Symbol	Name	Symbol	Name	Symbol	Name
1	L1	CH1 Output	L1H	CH1 Heating output	L1H	CH1 Heating output	CH1 OPEN	CH1 Open output
2	L2	CH2 Output	L1C	CH1 Cooling output	L1C	CH1 Cooling output	CH1 CLOSE	CH1 Close output
3	L3	CH3 Output	L2H	CH2 Heating output	L3	CH3 Output	CH2 OPEN	CH2 Open output
4	L4	CH4 Output	L2C	CH2 Cooling output	L4	CH4 Output	CH2 CLOSE	CH2 Close output
5	COM-	Output common	COM-	Output common	COM-	Output common	COM-	Output common
6	NC	Not used	NC	Not used	NC	Not used	NC	Not used
7	CH1A	CH1 Resistance thermometer A	CH1A	CH1 Resistance thermometer A	CH1A	CH1 Resistance thermometer A	CH1A	CH1 Resistance thermometer A
8	CH2A	CH2 Resistance thermometer A	CH2A	CH2 Resistance thermometer A	MT2A	Monitor 2 resistance thermometer A	CH2A	CH2 Resistance thermometer A
9	CH1B	CH1 Resistance thermometer B	CH1B	CH1 Resistance thermometer B	CH1B	CH1 Resistance thermometer B	CH1B	CH1 Resistance thermometer B
10	CH2B	CH2 Resistance thermometer B	CH2B	CH2 Resistance thermometer B	MT2B	Monitor 2 resistance thermometer B	CH2B	CH2 Resistance thermometer B
11	CH1b	CH1 Resistance thermometer b	CH1b	CH1 Resistance thermometer b	CH1b	CH1 Resistance thermometer b	CH1b	CH1 Resistance thermometer b
12	CH2b	CH2 Resistance thermometer b	CH2b	CH2 Resistance thermometer b	MT2b	Monitor 2 resistance thermometer b	CH2b	CH2 Resistance thermometer b
13	CH3A	CH3 Resistance thermometer A	MT3A	Monitor 3 resistance thermometer A	CH3A	CH3 Resistance thermometer A	MT3A	Monitor 3 resistance thermometer A
14	CH4A	CH4 Resistance thermometer A	MT4A	Monitor 4 resistance thermometer A	CH4A	CH4 Resistance thermometer A	MT4A	Monitor 4 resistance thermometer A

Terminal No.	Standard control		Heating-cooling control (normal mode)		Mix control (normal mode)		Position proportional control (normal mode)	
	Symbol	Name	Symbol	Name	Symbol	Name	Symbol	Name
15	CH3B	CH3 Resistance thermometer B	MT3B	Monitor 3 resistance thermometer B	CH3B	CH3 Resistance thermometer B	MT3B	Monitor 3 resistance thermometer B
16	CH4B	CH4 Resistance thermometer B	MT4B	Monitor 4 resistance thermometer B	CH4B	CH4 Resistance thermometer B	MT4B	Monitor 4 resistance thermometer B
17	CH3b	CH3 Resistance thermometer b	MT3b	Monitor 3 resistance thermometer b	CH3b	CH3 Resistance thermometer b	MT3b	Monitor 3 resistance thermometer b
18	CH4b	CH4 Resistance thermometer b	MT4b	Monitor 4 resistance thermometer b	CH4b	CH4 Resistance thermometer b	MT4b	Monitor 4 resistance thermometer b

- Heating-cooling control (expanded mode), mix control (expanded mode), and position proportional control (expanded mode)

Terminal No.	Heating-cooling control (expanded mode)		Mix control (expanded mode)		Position proportional control (expanded mode)	
	Symbol	Name	Symbol	Name	Symbol	Name
1	L1H	CH1 Heating output	L1H	CH1 Heating output	CH1 OPEN	CH1 Open output
2	L1C	CH1 Cooling output	L1C	CH1 Cooling output	CH1 CLOSE	CH1 Close output
3	L2H	CH2 Heating output	L3	CH3 Output	CH2 OPEN	CH2 Open output
4	L2C	CH2 Cooling output	L4	CH4 Output	CH2 CLOSE	CH2 Close output
5	COM-	Output common	COM-	Output common	COM-	Output common
6	NC	Not used	NC	Not used	NC	Not used
7	CH1A	CH1 Resistance thermometer A	CH1A	CH1 Resistance thermometer A	CH1A	CH1 Resistance thermometer A
8	CH2A	CH2 Resistance thermometer A	CH2A	CH2 Resistance thermometer A	CH2A	CH2 Resistance thermometer A
9	CH1B	CH1 Resistance thermometer B	CH1B	CH1 Resistance thermometer B	CH1B	CH1 Resistance thermometer B
10	CH2B	CH2 Resistance thermometer B	CH2B	CH2 Resistance thermometer B	CH2B	CH2 Resistance thermometer B
11	CH1b	CH1 Resistance thermometer b	CH1b	CH1 Resistance thermometer b	CH1b	CH1 Resistance thermometer b
12	CH2b	CH2 Resistance thermometer b	CH2b	CH2 Resistance thermometer b	CH2b	CH2 Resistance thermometer b
13	CH3A	CH3 Resistance thermometer A	CH3A	CH3 Resistance thermometer A	CH3A	CH3 Resistance thermometer A
14	CH4A	CH4 Resistance thermometer A	CH4A	CH4 Resistance thermometer A	CH4A	CH4 Resistance thermometer A
15	CH3B	CH3 Resistance thermometer B	CH3B	CH3 Resistance thermometer B	CH3B	CH3 Resistance thermometer B
16	CH4B	CH4 Resistance thermometer B	CH4B	CH4 Resistance thermometer B	CH4B	CH4 Resistance thermometer B
17	CH3b	CH3 Resistance thermometer b	CH3b	CH3 Resistance thermometer b	CH3b	CH3 Resistance thermometer b
18	CH4b	CH4 Resistance thermometer b	CH4b	CH4 Resistance thermometer b	CH4b	CH4 Resistance thermometer b

■R60TCRT2TT2BW (for CT input) and R60TCRT4BW (for CT input)



6

Terminal No.	Standard control and heating-cooling control	
	Symbol	Name
1	NC	Not used
2	CT1	CT input 1
3	CT1	CT input 1
4	CT2	CT input 2
5	CT2	CT input 2
6	CT3	CT input 3
7	CT3	CT input 3
8	CT4	CT input 4
9	CT4	CT input 4
10	CT5	CT input 5
11	CT5	CT input 5
12	CT6	CT input 6
13	CT6	CT input 6
14	CT7	CT input 7
15	CT7	CT input 7
16	CT8	CT input 8
17	CT8	CT input 8
18	NC	Not used

6.2 Wiring Precautions

External wiring that is less likely to be affected by noise is one of the conditions for a highly reliable system that fully utilizes the temperature control module.

This section describes wiring precautions.

- Use separate cables for the AC control circuit and the temperature control module's external I/O signals to avoid influence of AC side surges and induction.
- Do not locate external wires near the main circuit line, high-voltage circuit lines, and load circuit lines of devices other than programmable controllers such as an inverter. Also, do not bunch external wires with these lines. Otherwise, the external wires are more likely to be affected by noise, surges, and induction.
- Ground shielded cables at one end on the programmable controller side. However, depending on the external noise condition, it should be grounded on the other side.
- To ensure that this product maintains EMC and Low Voltage Directives, refer to the following.

 MELSEC iQ-R Module Configuration Manual

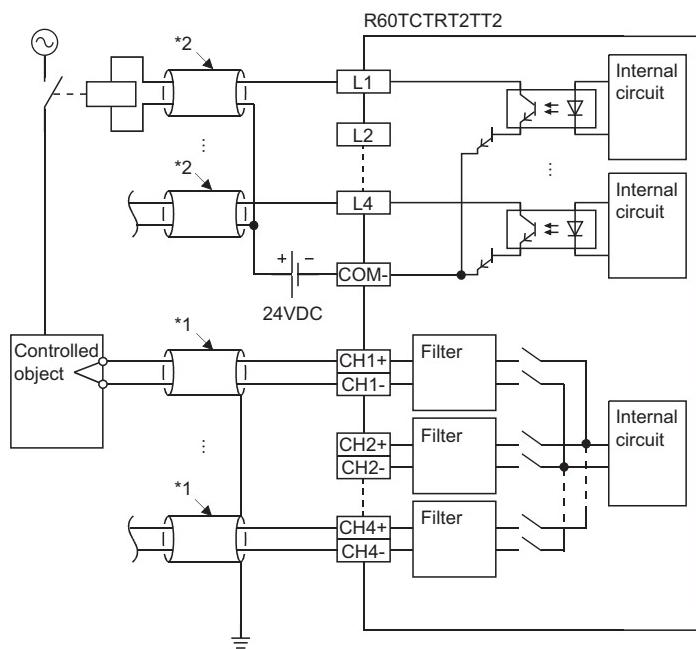
 Safety Guidelines (This manual is included with the base unit.)

6.3 External Wiring

The following figure shows the external wiring.

R60TCTRT2TT2

Standard control



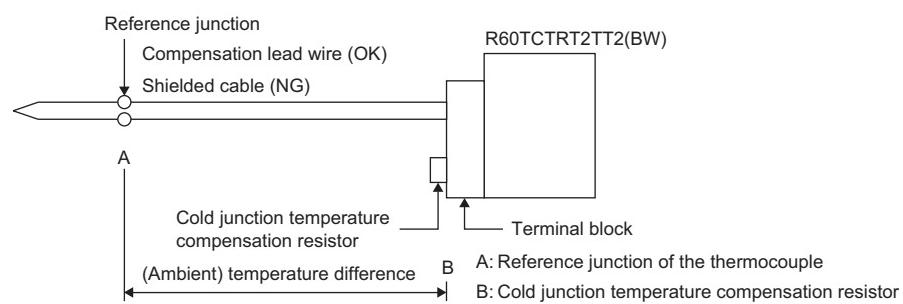
6

*1 Use the shielded compensation lead wire.

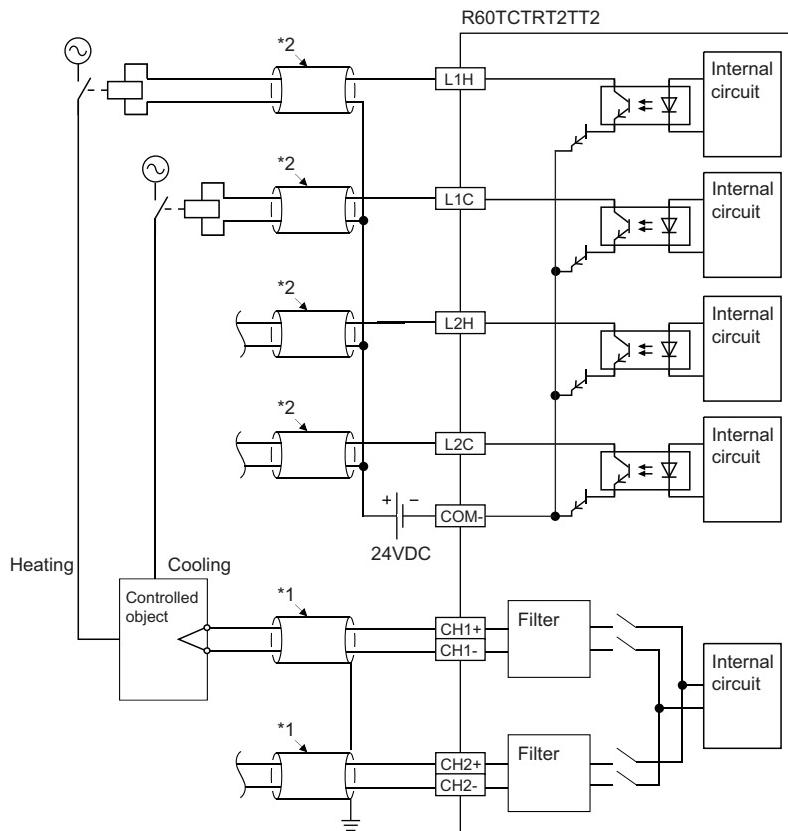
*2 Use the shielded cable.

Point

Use the compensation lead wire for the cable of a thermocouple. If the compensation lead wire is not used, and when the cold junction temperature compensation resistor is away from the end tip of a thermocouple, the (ambient) temperature difference may lead to a faulty temperature process value (PV).



Heating-cooling control

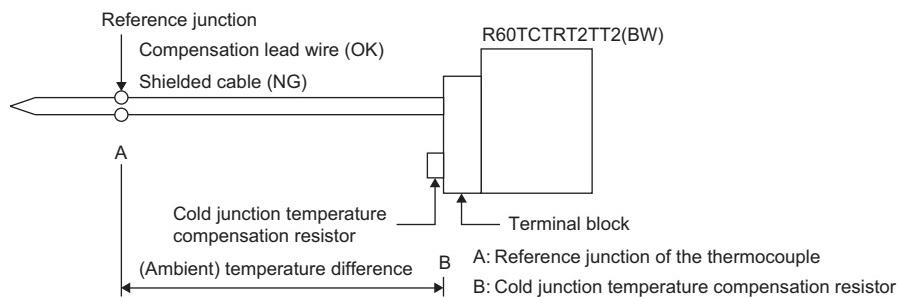


*1 Use the shielded compensation lead wire.

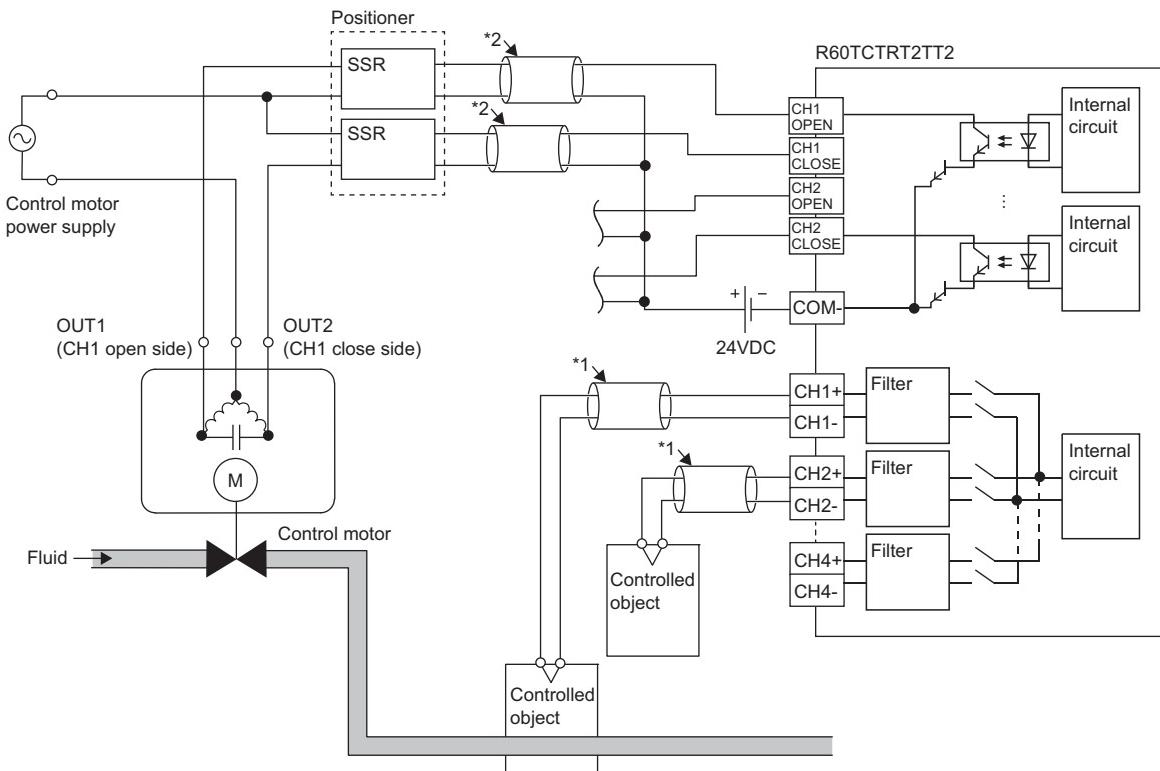
*2 Use the shielded cable.



Use the compensation lead wire for the cable of a thermocouple. If the compensation lead wire is not used, and when the cold junction temperature compensation resistor is away from the end tip of a thermocouple, the (ambient) temperature difference may lead to a faulty temperature process value (PV).



Position proportional control



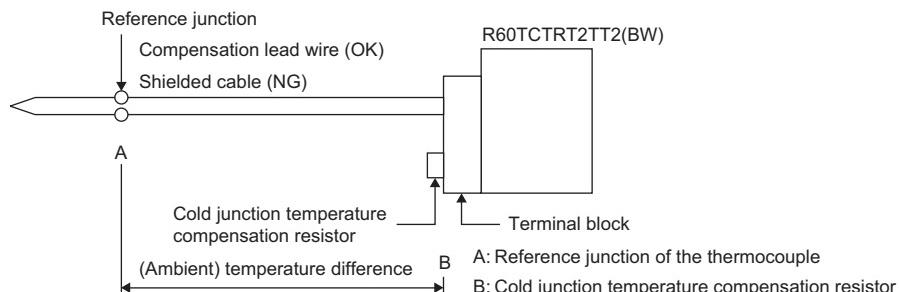
6

*1 Use the shielded compensation lead wire.

*2 Use the shielded cable.

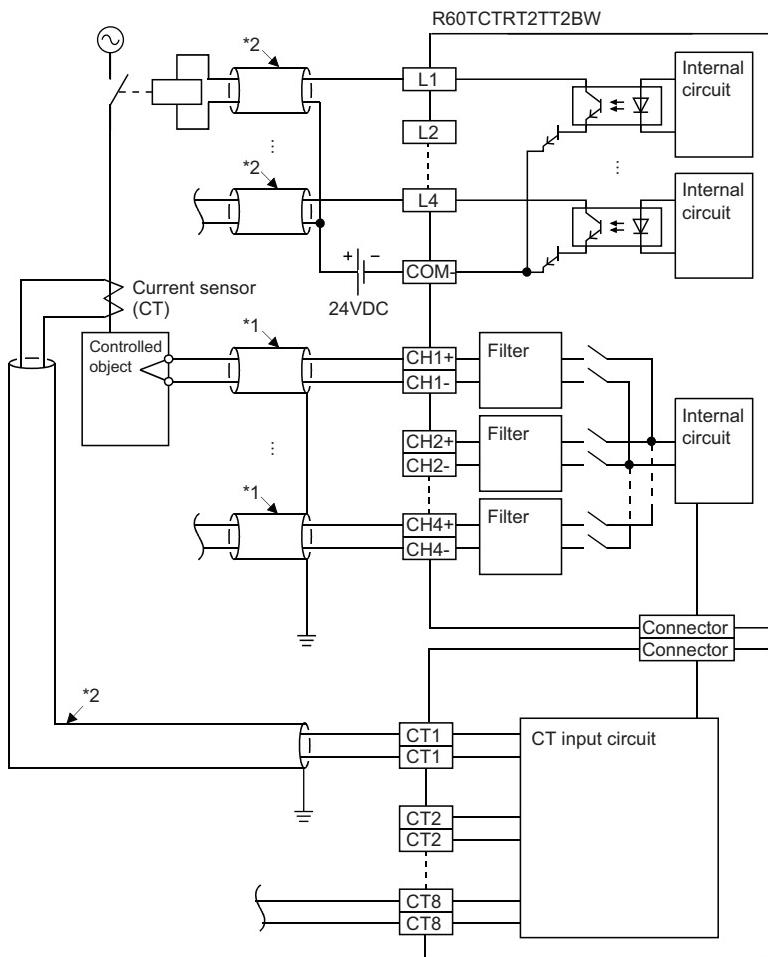
Point

Use the compensation lead wire for the cable of a thermocouple. If the compensation lead wire is not used, and when the cold junction temperature compensation resistor is away from the end tip of a thermocouple, the (ambient) temperature difference may lead to a faulty temperature process value (PV).



R60TCTRT2TT2BW

Standard control

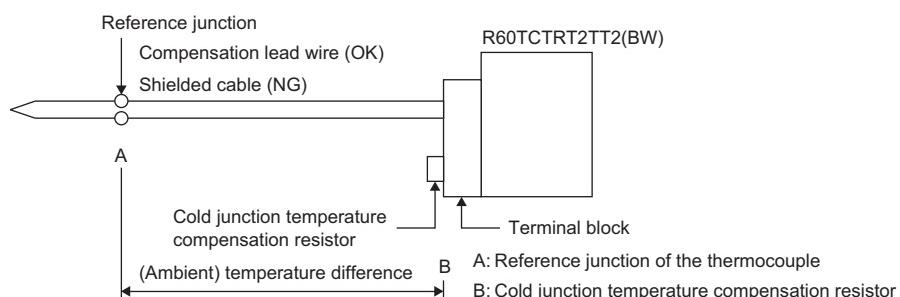


*1 Use the shielded compensation lead wire.

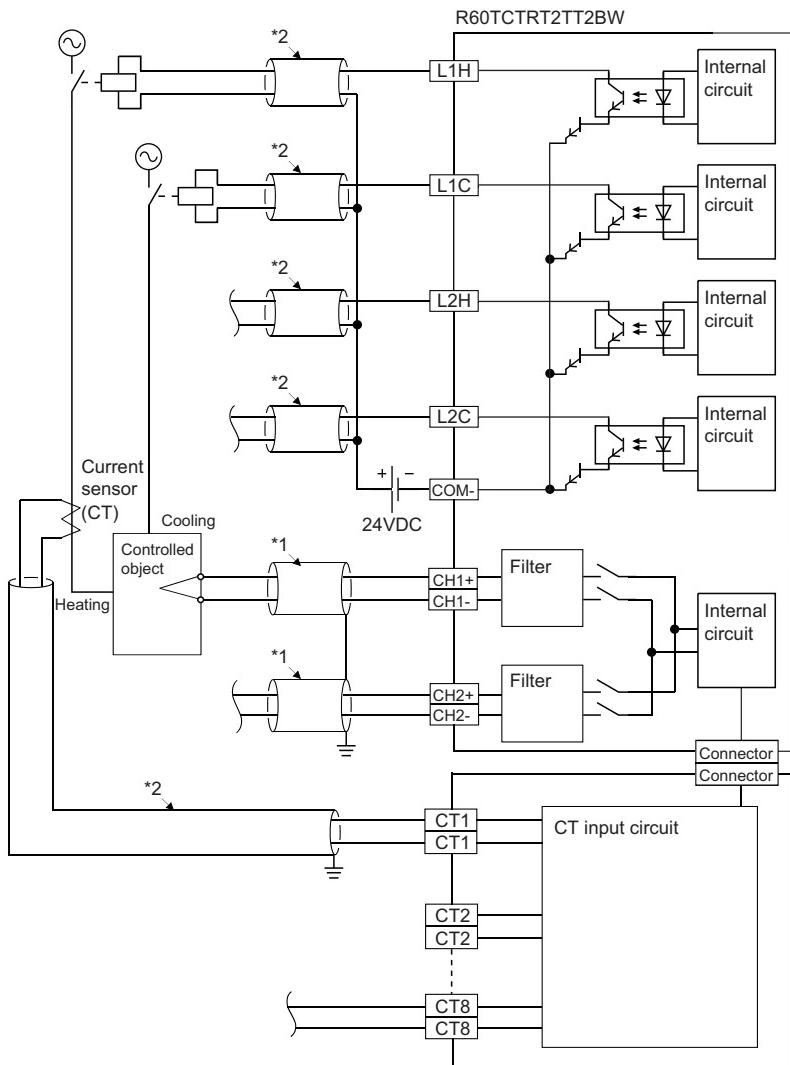
*2 Use the shielded cable.

Point

- To use the heater disconnection detection function, the CT input channel assignment must be set. Since the CT1 is used in the loop of CH1 in the above wiring example, set "CH1" for "CT input channel assignment setting" in the "CT setting" of CT1.
- Use the compensation lead wire for the cable of a thermocouple. If the compensation lead wire is not used, and when the cold junction temperature compensation resistor is away from the end tip of a thermocouple, the (ambient) temperature difference may lead to a faulty temperature process value (PV).



Heating-cooling control

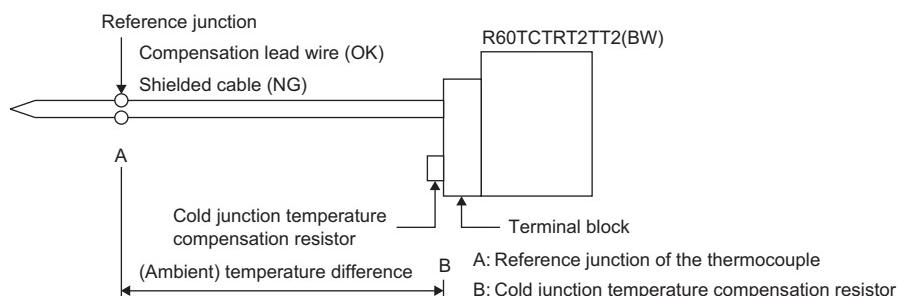


*1 Use the shielded compensation lead wire.

*2 Use the shielded cable.

Point

- To use the heater disconnection detection function, the CT input channel assignment must be set. Since the CT1 is used in the loop of CH1 in the above wiring example, set "CH1" for "CT input channel assignment setting" in the "CT setting" of CT1.
- Use the compensation lead wire for the cable of a thermocouple. If the compensation lead wire is not used, and when the cold junction temperature compensation resistor is away from the end tip of a thermocouple, the (ambient) temperature difference may lead to a faulty temperature process value (PV).



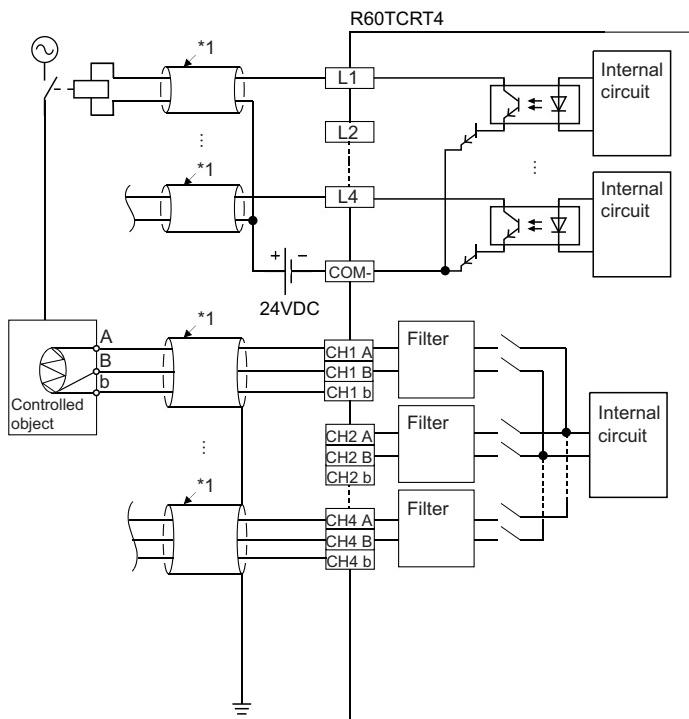
Position proportional control

The CT input is invalid in the position proportional control. For wiring examples, refer to the following.

☞ Page 39 Position proportional control

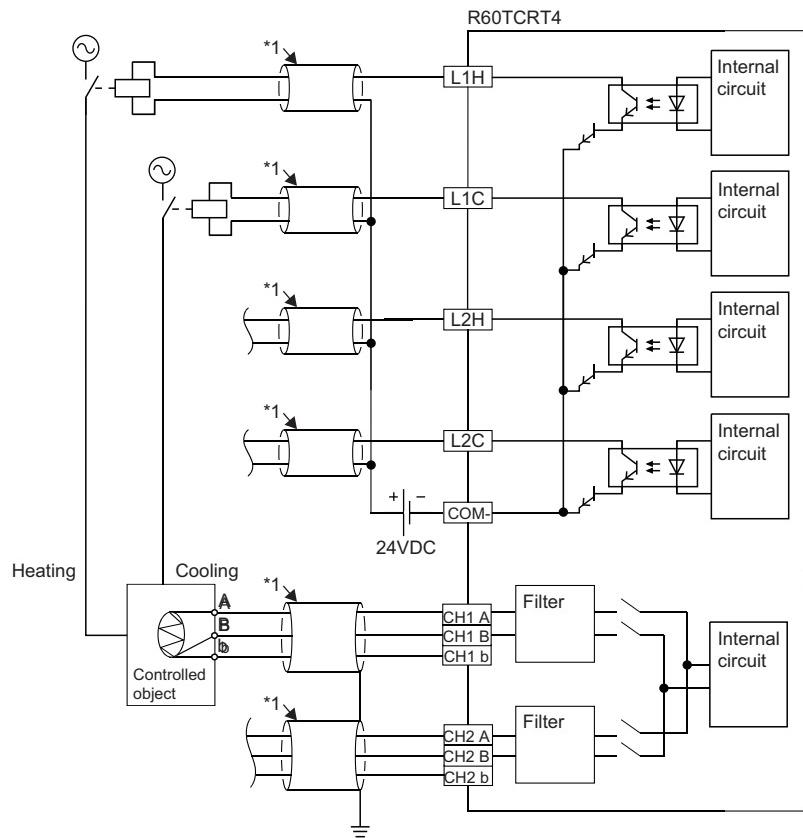
R60TCRT4

Standard control



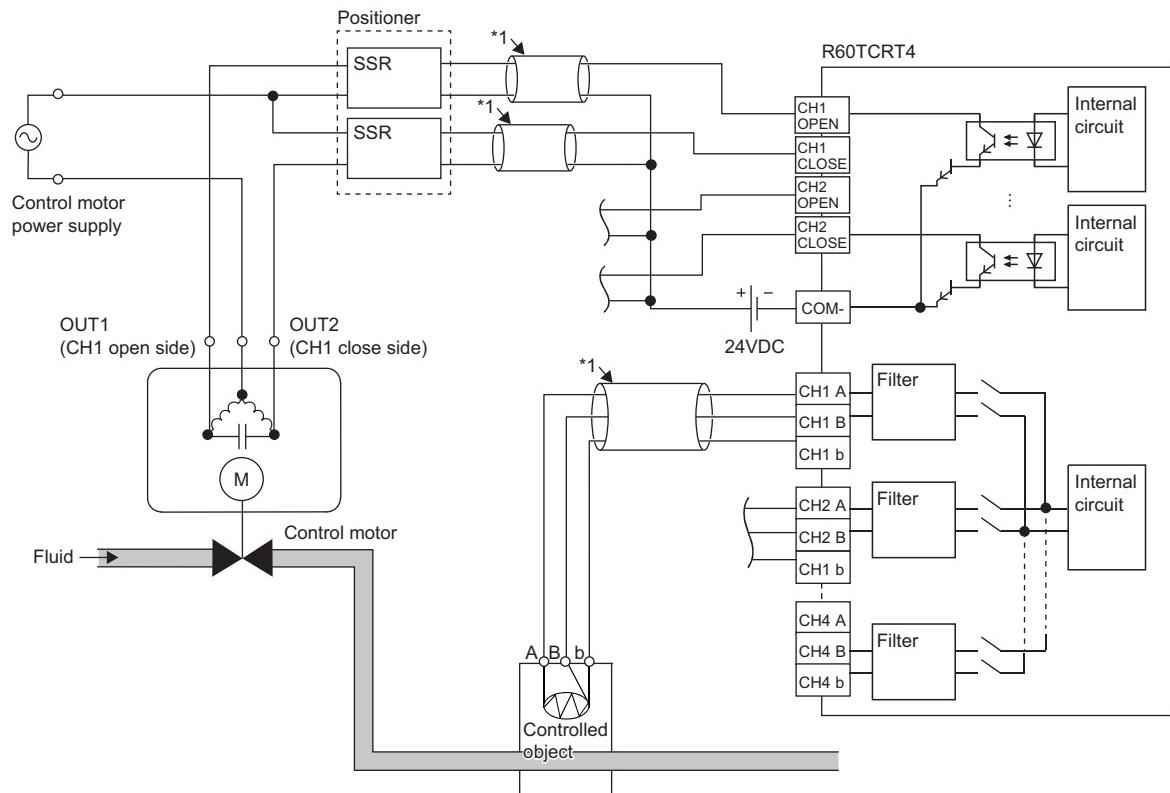
*1 Use the shielded cable.

Heating-cooling control



*1 Use the shielded cable.

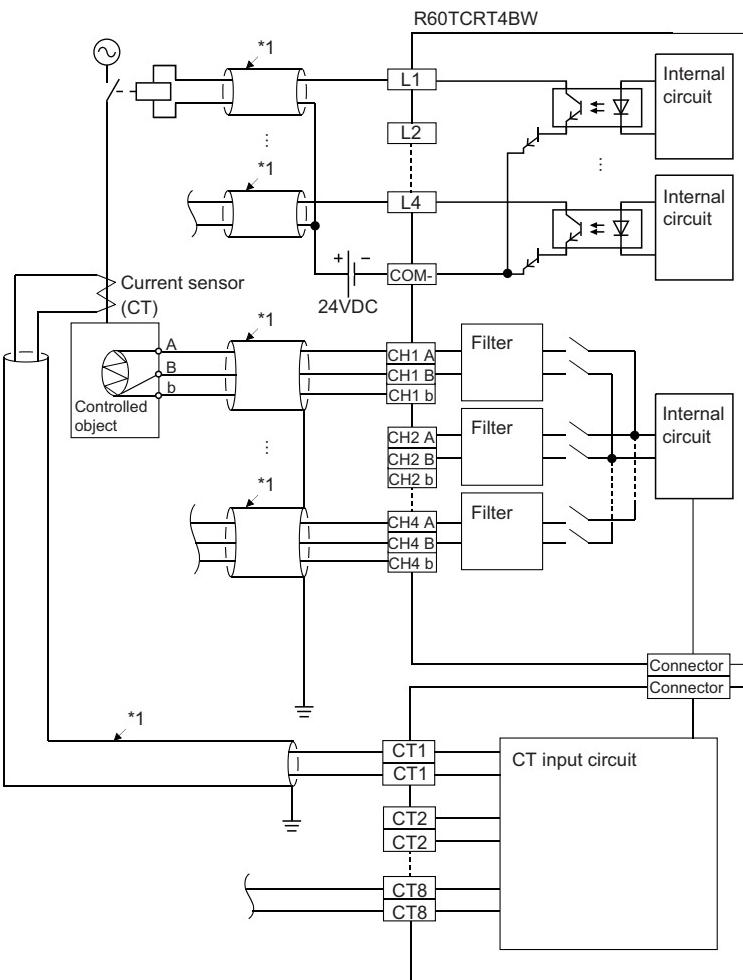
Position proportional control



*1 Use the shielded cable.

R60TCRT4BW

Standard control

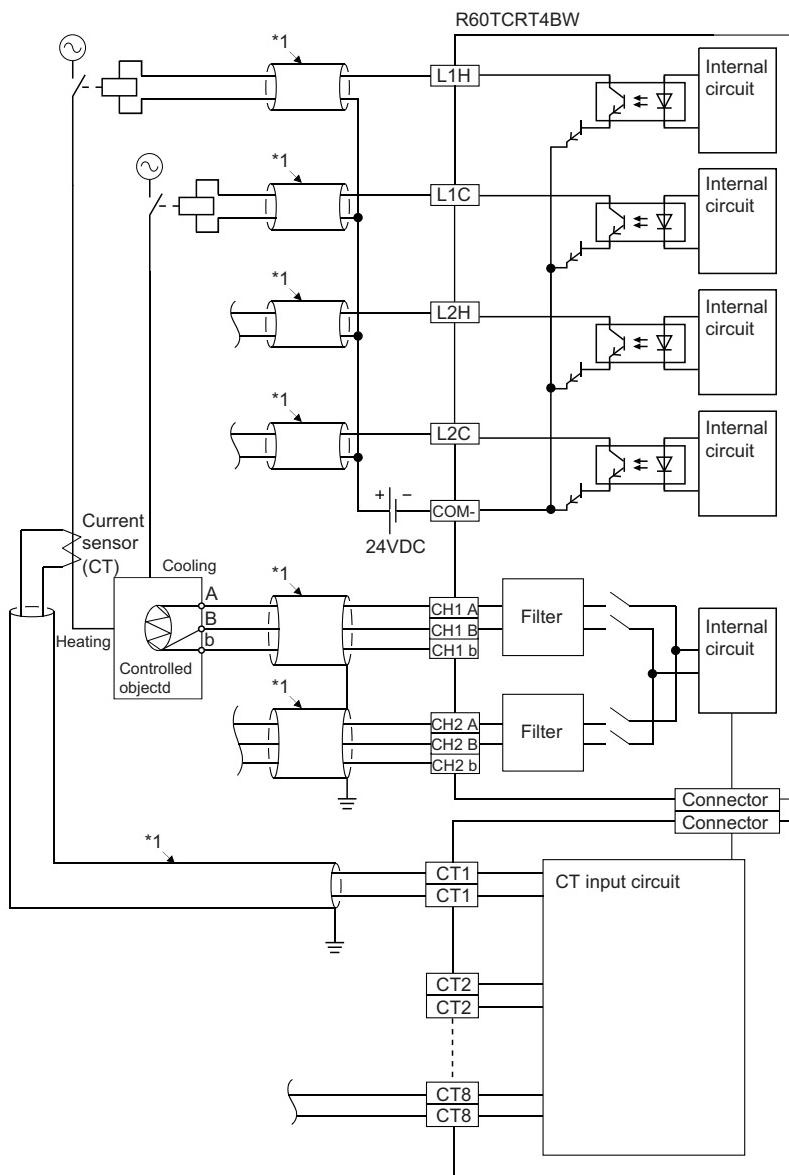


*1 Use the shielded cable.

Point

To use the heater disconnection detection function, the CT input channel assignment must be set. Since the CT1 is used in the loop of CH1 in the above wiring example, set "CH1" for "CT input channel assignment setting" in the "CT setting" of CT1.

Heating-cooling control



*1 Use the shielded cable.

Point

To use the heater disconnection detection function, the CT input channel assignment must be set. Since the CT1 is used in the loop of CH1 in the above wiring example, set "CH1" for "CT input channel assignment setting" in the "CT setting" of CT1.

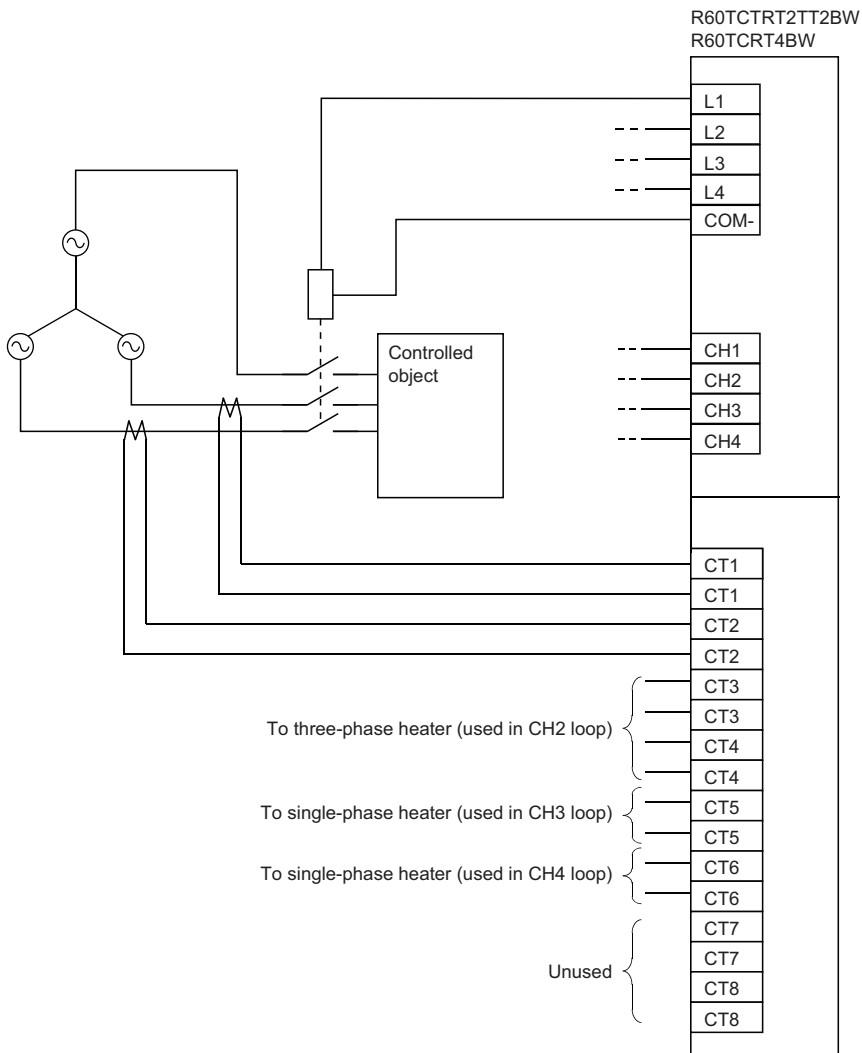
Position proportional control

The CT input is invalid in the position proportional control. For wiring examples, refer to the following.

☞ Page 44 Position proportional control

6.4 Heater Disconnection Detection Wiring and Setting Example for Three-phase Heater

The following shows the wiring and setting examples to detect a disconnection of a three-phase heater with the heater disconnection detection function.



6

The disconnection of the three-phase heater is detected by measuring the currents of two of the three cables.

In the above wiring example, set "CT input channel assignment setting" of "CT setting" as indicated below.

Item	Setting value
CT1	CH1 (1)
CT2	CH1 (1)
CT3	CH2 (2)
CT4	CH2 (2)
CT5	CH3(3)
CT6	CH4(4)
CT7	Unused (0)
CT8	Unused (0)

6.5 Unused Channel Setting

When no temperature sensor is connected to a channel, the temperature control module performs upscale processing for the channel. Therefore, when no temperature sensor has not been connected to a channel where no temperature control is to be performed, the module determines that the temperature process value (PV) has exceeded the temperature measuring range for the input range, and the ALM LED blinks.

Setting unused channels can prevent faulty alert detection because the PID control, temperature judgment, and alert judgment are not executed on the set channels.

Setting method

Set a value in "Unused channel setting" of "Control basic parameters" of "Application Setting". The following table shows the relation between each setting value and control status.

Setting value	Control status		
	PID control	Temperature judgment	Alert judgment
Used (0)	Performed (However, it depends on other setting status.)		
Unused (1)	Not performed		



Setting unused channels does not change the sampling cycle.

7 OPERATION EXAMPLES

This chapter describes the programming procedure and basic program of the temperature control module.

7.1 Programming Procedure

Create a program that operates the temperature control module using the following procedure.

1. Set parameters.
2. Create a program.



Using function blocks (FBs) can reduce the load at programming and improve the readability of a program.

For details on the function blocks, refer to the following.

MELSEC iQ-R Temperature Control Module Function Block Reference

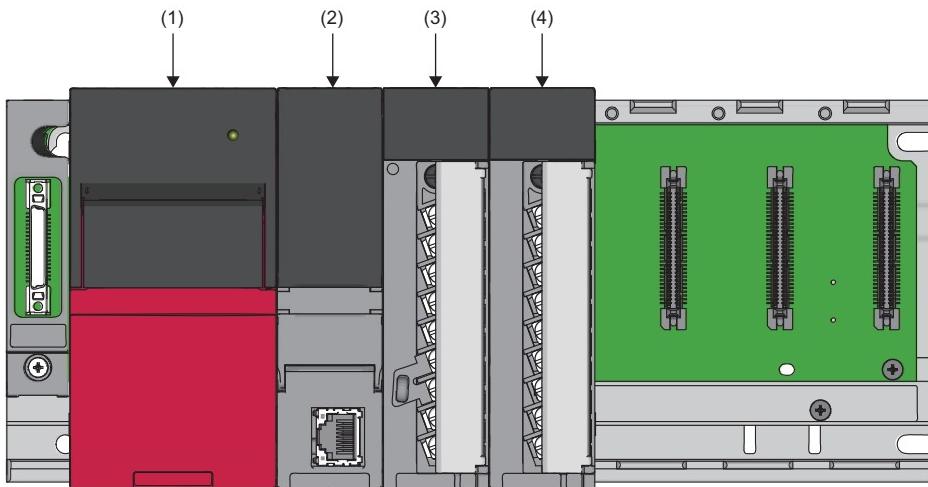
7.2 Program Examples

Standard control

7

System configuration

The following shows a system configuration example.



- (1) Power supply module (R61P)
- (2) CPU module (R120CPU)
- (3) Temperature control module (R60TCTRT2TT2)
- (4) Input module (RX10)

Parameter settings

Connect an engineering tool to the CPU module and set parameters.



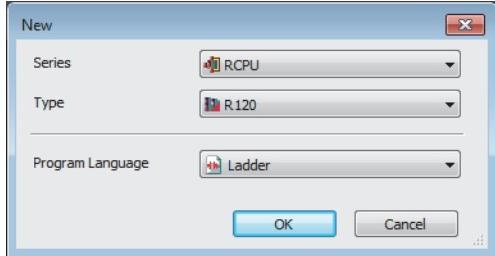
In these program examples, use the default setting for the parameters other than the set parameters. For parameters, refer to the following.

MELSEC iQ-R Temperature Control Module User's Manual (Application)

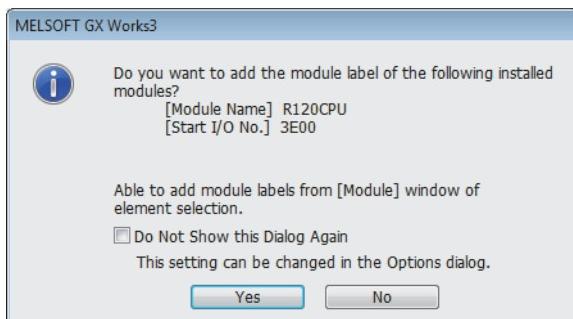
■Setting modules

1. Set the CPU module as follows.

[Project] ⇒ [New]

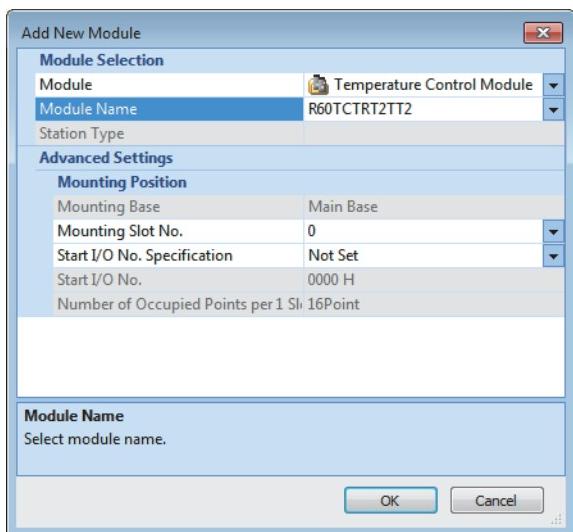


2. Click the [Yes] button and add labels of the CPU module.



3. Set the R60TCTRT2TT2 as follows.

[Navigation window] ⇒ [Parameter] ⇒ [Module Information] ⇒ Right-click ⇒ [Add New Module]



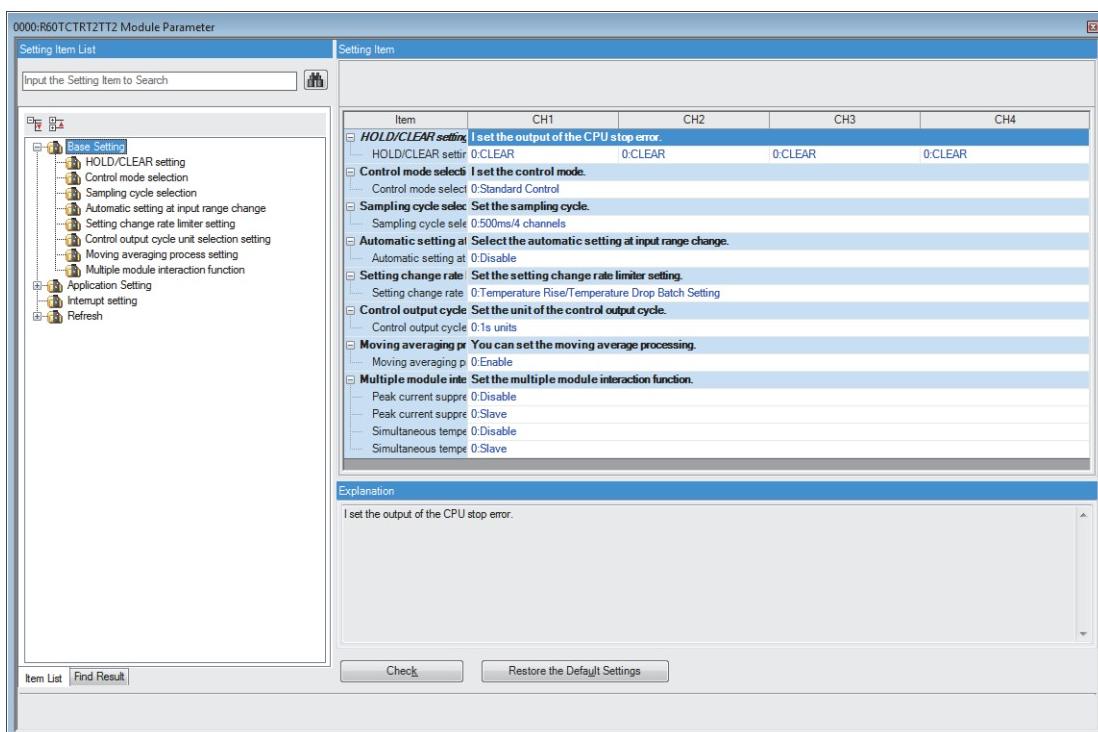
4. Click the [Yes] button and add labels of the R60TCTRT2TT2.



■Setting parameters of the temperature control module

1. Configure the settings in "Base Setting" as follows.

☞ [Navigation window] ⇔ [Parameter] ⇔ [Module Information] ⇔ [R60TCTRT2TT2] ⇔ [Module Parameter] ⇔ [Base Setting]



2. Configure the settings in "Application Setting" as follows.

 [Navigation window] ⇒ [Parameter] ⇒ [Module Information] ⇒ [R60TCTRT2TT2] ⇒ [Module Parameter] ⇒ [Application Setting]

- "Control basic parameters"

Set "Target Value(SV) Setting" of CH1 and "Unused channel setting" of CH2 to CH4 as shown below.

Item	CH1	CH2	CH3	CH4
Control basic parameters				
Input range setting	2.Thermocouple K Measured Te			
Target Value(SV) Setting	0°C	0°C	0°C	0°C
Unused channel setting	0:Used	1:Unused	1:Unused	1:Unused
Control output cycle setting	30 s	30 s	30 s	30 s
Control Response Parameters	0:Slow	0:Slow	0:Slow	0:Slow
Stop mode setting	1:Monitor	1:Monitor	1:Monitor	1:Monitor
PID continuation Flag	0:Stop			

- "Limiter setting"

Set "Upper Limit Setting Limiter" of CH1 as shown below.

Item	CH1	CH2	CH3	CH4
Limiter setting				
Upper limit output limiter	100.0 %	100.0 %	100.0 %	100.0 %
Lower Limit Output Limiter	0.0 %	0.0 %	0.0 %	0.0 %
Output Change Amount Limiter	0.0 %/s	0.0 %/s	0.0 %/s	0.0 %/s
Upper Limit Setting Limiter	400 °C	1300 °C	1300 °C	1300 °C
Lower Limit Setting Limiter	0 °C	0 °C	0 °C	0 °C
Setting change rate limiter	0 °C	0 °C	0 °C	0 °C
Setting change rate limiter (Temperature drop)	0 °C	0 °C	0 °C	0 °C
Setting change rate limiter unit time setting	0 s	0 s	0 s	0 s

- "Alert setting"

Set "Alert 1 mode setting" and "Alert set value 1" of CH1 as shown below.

Item	CH1	CH2	CH3	CH4
Alert setting				
Alert 1 mode setting	Set the temperature process value (PV) or alert status of the deviation.			
Alert 2 mode setting	1:Upper Limit Input Alert	0:Not Warning	0:Not Warning	0:Not Warning
Alert 3 mode setting	0:Not Warning	0:Not Warning	0:Not Warning	0:Not Warning
Alert 4 mode setting	0:Not Warning	0:Not Warning	0:Not Warning	0:Not Warning
Alert set value 1	250 °C	0 °C	0 °C	0 °C
Alert set value 2	0 °C	0 °C	0 °C	0 °C
Alert set value 3	0 °C	0 °C	0 °C	0 °C
Alert set value 4	0 °C	0 °C	0 °C	0 °C
Alert dead band setting	5 °C	5 °C	5 °C	5 °C
Number of alert delay	0 Times	0 Times	0 Times	0 Times

- "Auto tuning setting"

Set "Automatic backup setting after auto tuning of PID constants" of CH1 as shown below.

Item	CH1	CH2	CH3	CH4
Auto tuning setting				
Auto tuning mode setting	0:Standard Mode	0:Standard Mode	0:Standard Mode	0:Standard Mode
Auto tuning forced termination time setting	120 min	120 min	120 min	120 min
During AT loop disconnection detection function is enabled / disabled	0:Disable	0:Disable	0:Disable	0:Disable
AT Bias	0 °C	0 °C	0 °C	0 °C
Automatic backup setting after auto tuning of PID constants	1:ON	0:OFF	0:OFF	0:OFF



Use the default values for the parameters other than the parameters shown above.

■Writing to the CPU module

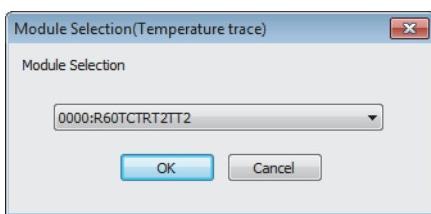
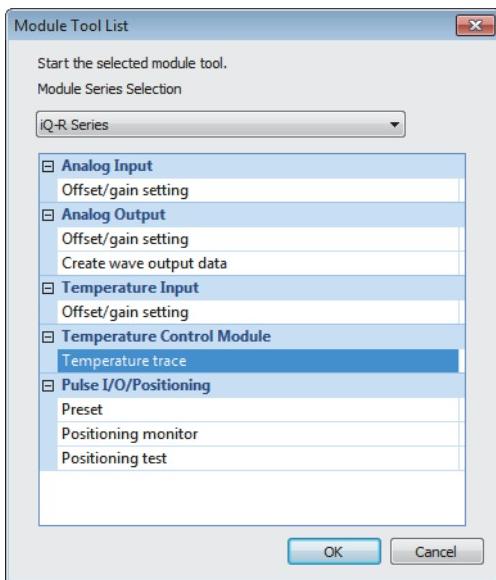
1. Write the set parameters to the CPU module, reset the CPU module, and turn off and on the power supply.

 [Online] ⇒ [Write to PLC]

Auto tuning

Perform auto tuning.

[Tool] ⇒ [Module Tool List]



Name	CH1	CH2	CH3	CH4
Control command				
Setting/Operation mode command	1:Operation mode command			
Setting/Operation mode status	1:Operation mode			
Auto turning command	1:ON	0:OFF	0:OFF	0:OFF
Auto turning status	Executing	Stopped	Stopped	Stopped
PID control force stop command	0:OFF	0:OFF	0:OFF	0:OFF
Setting value back up command	0:OFF			
Setting value back up completed fla	0:OFF			
Forced feed forward control starting	0:OFF	0:OFF	0:OFF	0:OFF
Forced feed forward control starting	0:OFF	0:OFF	0:OFF	0:OFF
AUTO/MAN mode shift	0:AUTO	0:AUTO	0:AUTO	0:AUTO

Name	CH1	CH2	CH3	CH4
Control command				
Setting/Operation mode command	1:Operation mode command			
Setting/Operation mode status	1:Operation mode			
Auto turning command	1:ON	0:OFF	0:OFF	0:OFF
Auto turning status	Stopped	Stopped	Stopped	Stopped
PID control force stop command	0:OFF	0:OFF	0:OFF	0:OFF
Setting value back up command	0:OFF			
Setting value back up completed fla	0:OFF			
Forced feed forward control starting	0:OFF	0:OFF	0:OFF	0:OFF
Forced feed forward control starting	0:OFF	0:OFF	0:OFF	0:OFF
AUTO/MAN mode shift	0:AUTO	0:AUTO	0:AUTO	0:AUTO

1. Select "Temperature trace" of "Temperature Control Module" and click the [OK] button.

2. Select the module to configure the temperature control setting and click the [OK] button.

3. Select "Monitor data write" from the following.

[Setting] ⇒ [Monitor data write]

4. Set "Setting/Operation mode command" to "1:Operation mode command".

5. Set "Auto tuning command" to "1:ON".

6. Then, "Auto tuning status" is set to "Executing", and auto tuning is started.

7. When auto tuning is completed, "Auto tuning status" is set to "Stopped".

8. Temperature control is performed by set PID constants.

Setting labels

GX Works3 has functions supporting program creation.

The following table lists the module labels and global labels used in these program examples.

Do not change the settings of the module labels. For details on global labels, refer to the following.

MELSEC iQ-R Programming Manual (Program Design)

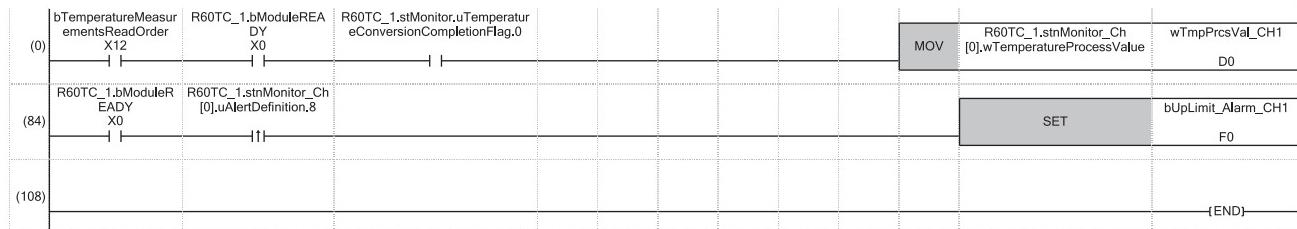
Classification	Label name	Description	Device																																																						
Module label	R60TC_1.bModuleREADY	Module READY flag	X0																																																						
	R60TC_1.bSettingChangeCommand	Setting change command	YB																																																						
	R60TC_1.bSettingOperationModeCommand	Setting/operation mode command	Y1																																																						
	R60TC_1.stMonitor.uTemperatureConversionCompletionFlag.0	CH1 Temperature conversion completion flag	—																																																						
	R60TC_1.stnMonitor_Ch[0].wTemperatureProcessValue	CH1 Temperature process value (PV)	—																																																						
	R60TC_1.stnMonitor_Ch[0].uAlertDefinition.8	CH1 Alert definition	—																																																						
Label to be defined	Define global labels as follows. • Program that changes the setting/operation mode	<table border="1"> <thead> <tr> <th></th> <th>Label Name</th> <th>Data Type</th> <th>Class</th> <th>Assign (Device/Label)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>bMovementModeSettingOrder</td> <td>Bit</td> <td>... VAR_GLOBAL</td> <td>▼ X11</td> </tr> </tbody> </table> • Program that processes data when the upper limit input alert occurs		Label Name	Data Type	Class	Assign (Device/Label)	1	bMovementModeSettingOrder	Bit	... VAR_GLOBAL	▼ X11	<table border="1"> <thead> <tr> <th></th> <th>Label Name</th> <th>Data Type</th> <th>Class</th> <th>Assign (Device/Label)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>bUpLimit_Alarm_CH1</td> <td>Bit</td> <td>... VAR_GLOBAL</td> <td>▼ F0</td> </tr> <tr> <td>2</td> <td>bTemperatureMeasurementsReadOrder</td> <td>Bit</td> <td>... VAR_GLOBAL</td> <td>▼ X12</td> </tr> <tr> <td>3</td> <td>wTmpPrcsVal_CH1</td> <td>Word [Signed]</td> <td>... VAR_GLOBAL</td> <td>▼ D0</td> </tr> </tbody> </table> • Program that displays and clears an error code		Label Name	Data Type	Class	Assign (Device/Label)	1	bUpLimit_Alarm_CH1	Bit	... VAR_GLOBAL	▼ F0	2	bTemperatureMeasurementsReadOrder	Bit	... VAR_GLOBAL	▼ X12	3	wTmpPrcsVal_CH1	Word [Signed]	... VAR_GLOBAL	▼ D0																								
	Label Name	Data Type	Class	Assign (Device/Label)																																																					
1	bMovementModeSettingOrder	Bit	... VAR_GLOBAL	▼ X11																																																					
	Label Name	Data Type	Class	Assign (Device/Label)																																																					
1	bUpLimit_Alarm_CH1	Bit	... VAR_GLOBAL	▼ F0																																																					
2	bTemperatureMeasurementsReadOrder	Bit	... VAR_GLOBAL	▼ X12																																																					
3	wTmpPrcsVal_CH1	Word [Signed]	... VAR_GLOBAL	▼ D0																																																					
	<table border="1"> <thead> <tr> <th></th> <th>Label Name</th> <th>Data Type</th> <th>Class</th> <th>Assign (Device/Label)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>bErrStartOrder</td> <td>Bit</td> <td>... VAR_GLOBAL</td> <td>▼ X13</td> </tr> <tr> <td>2</td> <td>bErrResetReq</td> <td>Bit</td> <td>... VAR_GLOBAL</td> <td>▼ X14</td> </tr> <tr> <td>3</td> <td>bErrFbReq</td> <td>Bit</td> <td>... VAR_GLOBAL</td> <td>▼ M10</td> </tr> <tr> <td>4</td> <td>bOperateError_ENO</td> <td>Bit</td> <td>... VAR_GLOBAL</td> <td>▼ M11</td> </tr> <tr> <td>5</td> <td>bOperateError_OK</td> <td>Bit</td> <td>... VAR_GLOBAL</td> <td>▼ M12</td> </tr> <tr> <td>6</td> <td>bOperateError_ModuleErr</td> <td>Bit</td> <td>... VAR_GLOBAL</td> <td>▼ M13</td> </tr> <tr> <td>7</td> <td>uOperateError_ModuleErrId</td> <td>Word [Unsigned]/Bit String [16-bit]</td> <td>... VAR_GLOBAL</td> <td>▼ D10</td> </tr> <tr> <td>8</td> <td>uOperateError_ModuleErrAddr</td> <td>Word [Unsigned]/Bit String [16-bit]</td> <td>... VAR_GLOBAL</td> <td>▼ D11</td> </tr> <tr> <td>9</td> <td>bOperateError_Err</td> <td>Bit</td> <td>... VAR_GLOBAL</td> <td>▼ M14</td> </tr> <tr> <td>10</td> <td>uOperateError_ErrId</td> <td>Word [Unsigned]/Bit String [16-bit]</td> <td>... VAR_GLOBAL</td> <td>▼ D12</td> </tr> </tbody> </table>		Label Name	Data Type	Class	Assign (Device/Label)	1	bErrStartOrder	Bit	... VAR_GLOBAL	▼ X13	2	bErrResetReq	Bit	... VAR_GLOBAL	▼ X14	3	bErrFbReq	Bit	... VAR_GLOBAL	▼ M10	4	bOperateError_ENO	Bit	... VAR_GLOBAL	▼ M11	5	bOperateError_OK	Bit	... VAR_GLOBAL	▼ M12	6	bOperateError_ModuleErr	Bit	... VAR_GLOBAL	▼ M13	7	uOperateError_ModuleErrId	Word [Unsigned]/Bit String [16-bit]	... VAR_GLOBAL	▼ D10	8	uOperateError_ModuleErrAddr	Word [Unsigned]/Bit String [16-bit]	... VAR_GLOBAL	▼ D11	9	bOperateError_Err	Bit	... VAR_GLOBAL	▼ M14	10	uOperateError_ErrId	Word [Unsigned]/Bit String [16-bit]	... VAR_GLOBAL	▼ D12	
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Program examples

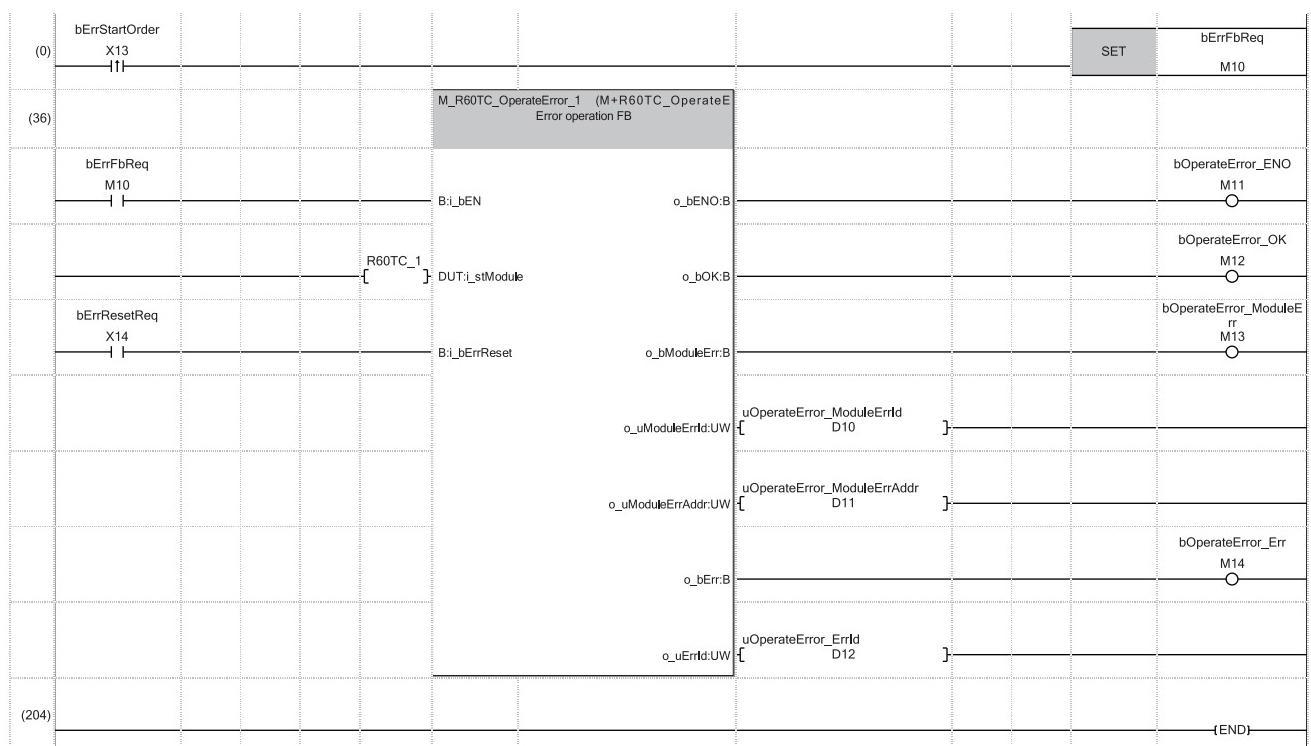
■ Program that changes the setting/operation mode



■ Program that processes data when the upper limit input alert occurs



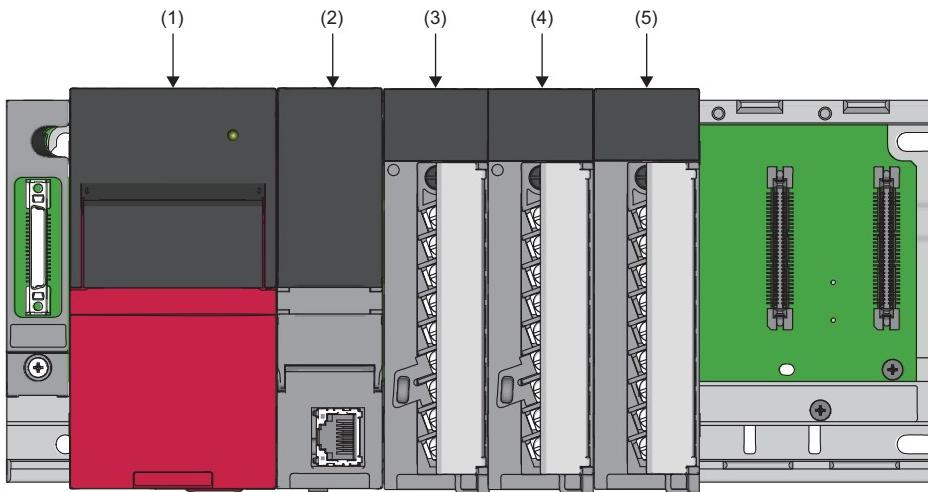
■ Program that displays and clears an error code



Standard control (When using the inter-module simultaneous temperature rise function)

System configuration

The following shows a system configuration example.



- (1) Power supply module (R61P)
- (2) CPU module (R120CPU)
- (3) Temperature control module 1 (R60TCTRT2TT2)
- (4) Temperature control module 2 (R60TCTRT2TT2)
- (5) Input module (RX10)

Parameter settings

Connect an engineering tool to the CPU module and set parameters.



In these program examples, use the default setting for the parameters other than the set parameters. For parameters, refer to the following.

MELSEC iQ-R Temperature Control Module User's Manual (Application)

■Setting modules

For how to set the module, refer to the following.

Page 50 Setting modules

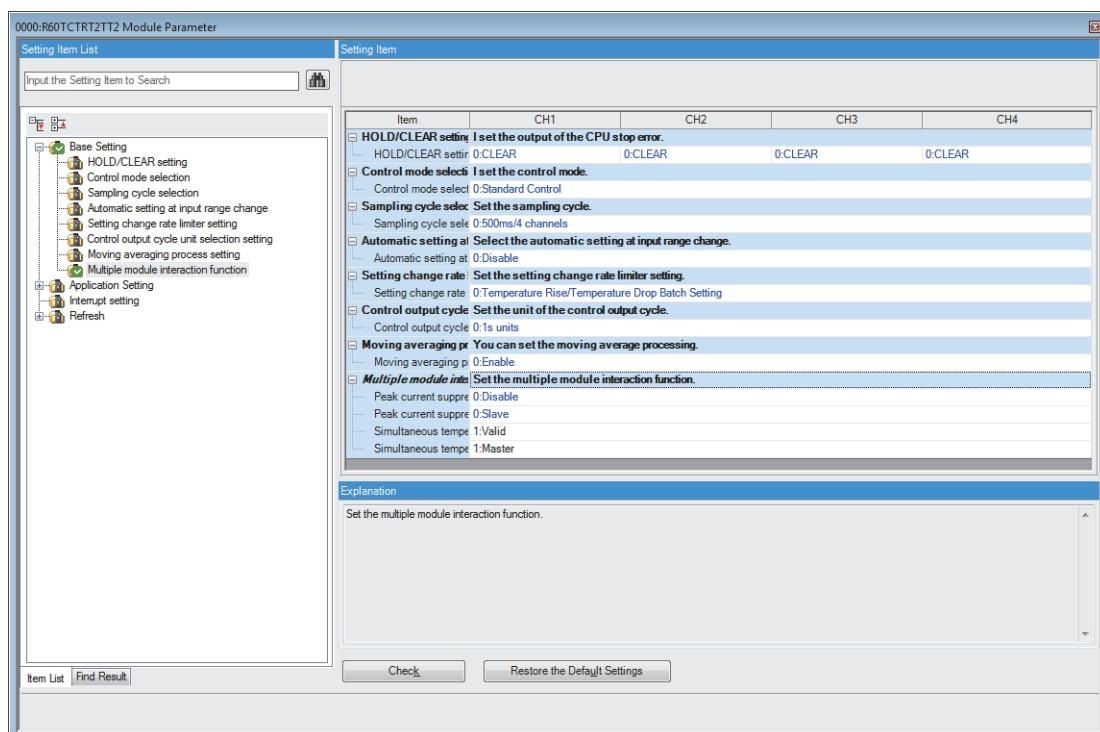
■Setting parameters of the temperature control module 1

1. Configure the settings in "Base Setting" as follows.

☞ [Navigation window] ⇒ [Parameter] ⇒ [Module Information] ⇒ [R60TCTRT2TT2] ⇒ [Module Parameter] ⇒ [Base Setting]

- "Multiple module interaction function"

Set "Simultaneous temperature rise function enable/disable between multiple module" and "Simultaneous temperature rise function master/slave selection between multiple module" as shown below.



2. Configure the settings in "Application Setting" as follows.

 [Navigation window] \Rightarrow [Parameter] \Rightarrow [Module Information] \Rightarrow [R60TCTRT2TT2] \Rightarrow [Module Parameter] \Rightarrow [Application Setting]

- "Control basic parameters"

Set "Target Value(SV) Setting" of CH1 and CH2, and "Unused channel setting" of CH3 and CH4 as shown below.

Item	CH1	CH2	CH3	CH4
Control basic parameters	Set the control basic parameters.			
Input range setting	2:Thermocouple K Measured Te	2:Thermocouple K Measured Te	2:Thermocouple K Measured Te	2:Thermocouple K Measured Te
Target Value(SV) Setting	200 °C	250 °C	0 °C	0 °C
Unused channel setting	0:Used	0:Used	1:Unused	1:Unused
Control output cycle setting	30 s	30 s	30 s	30 s
Control Response Parameters	0:Slow	0:Slow	0:Slow	0:Slow
Stop mode setting	1:Monitor	1:Monitor	1:Monitor	1:Monitor
PID continuation Flag	0:Stop			

- "Limiter setting"

Set "Upper Limit Setting Limiter" of CH1 and CH2 as shown below.

Item	CH1	CH2	CH3	CH4
Limiter setting	Set the limiter.			
Upper limit output limiter	100.0 %	100.0 %	100.0 %	100.0 %
Lower Limit Output Limiter	0.0 %	0.0 %	0.0 %	0.0 %
Output Change Amount Limiter	0.0 %/s	0.0 %/s	0.0 %/s	0.0 %/s
Upper Limit Setting Limiter	400 °C	500 °C	1300 °C	1300 °C
Lower Limit Setting Limiter	0 °C	0 °C	0 °C	0 °C
Setting change rate limiter	0 °C	0 °C	0 °C	0 °C
Setting change rate limiter (Temperature drop)	0 °C	0 °C	0 °C	0 °C
Setting change rate limiter unit time setting	0 s	0 s	0 s	0 s

- "Simultaneous temperature rise setting"

Set "Simultaneous temperature rise group setting" and "Simultaneous temperature rise AT mode setting" of CH1 and CH2 as shown below.

Item	CH1	CH2	CH3	CH4
Simultaneous temperature rise setting	Set the simultaneous temperature rise function.			
Simultaneous temperature rise group setting	1:Group 1	1:Group 1	0:Do not rise temperature	0:Do not rise temperature
Simultaneous temperature rise AT mode setting	1:AT for Simultaneous Te	1:AT for Simultaneous Te	0:Conventional AT	0:Conventional AT

- "Alert setting"

Set "Alert 1 mode setting" and "Alert set value 1" of CH1 and CH2 as shown below.

Item	CH1	CH2	CH3	CH4
Alert setting	Set the temperature process value (PV) or alert status of the deviation.			
Alert 1 mode setting	1:Upper Limit Input Alert	1:Upper Limit Input Alert	0:Not Warning	0:Not Warning
Alert 2 mode setting	0:Not Warning	0:Not Warning	0:Not Warning	0:Not Warning
Alert 3 mode setting	0:Not Warning	0:Not Warning	0:Not Warning	0:Not Warning
Alert 4 mode setting	0:Not Warning	0:Not Warning	0:Not Warning	0:Not Warning
Alert set value 1	250 °C	300 °C	0 °C	0 °C
Alert set value 2	0 °C	0 °C	0 °C	0 °C
Alert set value 3	0 °C	0 °C	0 °C	0 °C
Alert set value 4	0 °C	0 °C	0 °C	0 °C
Alert dead band setting	5 °C	5 °C	5 °C	5 °C
Number of alert delay	0 Times	0 Times	0 Times	0 Times

- "Auto tuning setting"

Set "Automatic backup setting after auto tuning of PID constants" of CH1 and CH2 as shown below.

Item	CH1	CH2	CH3	CH4
Auto tuning setting	Set the auto tuning.			
Auto tuning mode setting	0:Standard Mode	0:Standard Mode	0:Standard Mode	0:Standard Mode
Auto tuning forced termination time setting	120 min	120 min	120 min	120 min
During AT loop disconnection detection function is enabled / disabled	0:Disable	0:Disable	0:Disable	0:Disable
AT Bias	0 °C	0 °C	0 °C	0 °C
Automatic backup setting after auto tuning of PID constants	1:ON	1:ON	0:OFF	0:OFF



Use the default values for the parameters other than the parameters shown above.

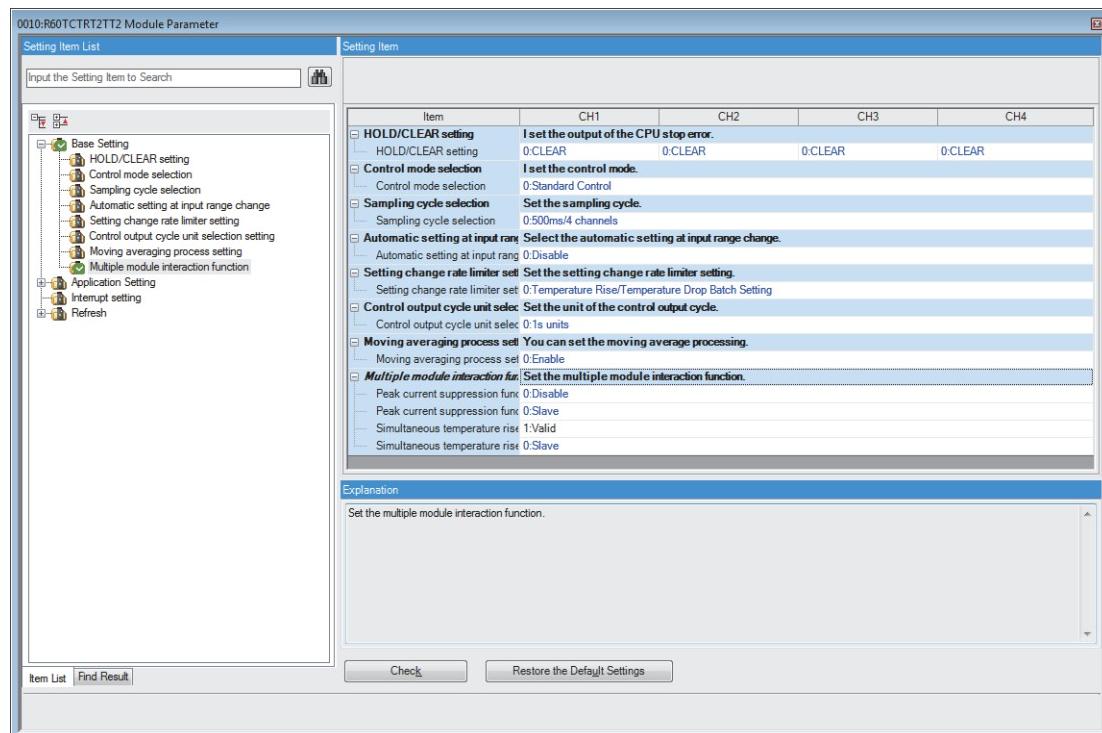
■Setting parameters of the temperature control module 2

1. Configure the settings in "Base Setting" as follows.

☞ [Navigation window] ⇒ [Parameter] ⇒ [Module Information] ⇒ [R60TCTRT2TT2] ⇒ [Module Parameter] ⇒ [Base Setting]

- "Multiple module interaction function"

Set "Simultaneous temperature rise function enable/disable between multiple module" as shown below.



2. Configure the settings in "Application Setting" as follows.

[Navigation window] \Rightarrow [Parameter] \Rightarrow [Module Information] \Rightarrow [R60TCTRT2TT2] \Rightarrow [Module Parameter] \Rightarrow [Application Setting]

- "Control basic parameters"

Set "Target Value(SV) Setting" of CH1 and CH2, and "Unused channel setting" of CH3 and CH4 as shown below.

Item	CH1	CH2	CH3	CH4
Set the control basic parameters.				
2.Thermocouple K Measured Te	2.Thermocouple K Measured Te	2.Thermocouple K Measured Te	2.Thermocouple K Measured Te	2.Thermocouple K Measured Te
150 °C	100 °C	0 °C	0 °C	0 °C
0:Used	0:Used	1:Unused	1:Unused	1:Unused
30 s	30 s	30 s	30 s	30 s
0:Slow	0:Slow	0:Slow	0:Slow	0:Slow
1:Monitor	1:Monitor	1:Monitor	1:Monitor	1:Monitor
0:Stop				

- "Limiter setting"

Set "Upper Limit Setting Limiter" of CH1 and CH2 as shown below.

Item	CH1	CH2	CH3	CH4
Set the limiter.				
100.0 %	100.0 %	100.0 %	100.0 %	100.0 %
0.0 %	0.0 %	0.0 %	0.0 %	0.0 %
0.0 %/s	0.0 %/s	0.0 %/s	0.0 %/s	0.0 %/s
300 °C	200 °C	1300 °C	1300 °C	1300 °C
0 °C	0 °C	0 °C	0 °C	0 °C
0 °C	0 °C	0 °C	0 °C	0 °C
0 °C	0 °C	0 °C	0 °C	0 °C
0 s	0 s	0 s	0 s	0 s

- "Simultaneous temperature rise setting"

Set "Simultaneous temperature rise group setting" and "Simultaneous temperature rise AT mode setting" of CH1 and CH2 as shown below.

Item	CH1	CH2	CH3	CH4
Set the simultaneous temperature rise function.				
1:Group 1	1:Group 1	0:Do not rise temperature	0:Do not rise temperature	
1:AT for Simultaneous Te	1:AT for Simultaneous Te	0:Conventional AT	0:Conventional AT	

- "Alert setting"

Set "Alert 1 mode setting" and "Alert set value 1" of CH1 and CH2 as shown below.

Item	CH1	CH2	CH3	CH4
Set the temperature process value (PV) or alert status of the deviation.				
1:Upper Limit Input Alert	1:Upper Limit Input Alert	0:Not Warning	0:Not Warning	0:Not Warning
0:Not Warning	0:Not Warning	0:Not Warning	0:Not Warning	0:Not Warning
0:Not Warning	0:Not Warning	0:Not Warning	0:Not Warning	0:Not Warning
0:Not Warning	0:Not Warning	0:Not Warning	0:Not Warning	0:Not Warning
200 °C	150 °C	0 °C	0 °C	0 °C
0 °C	0 °C	0 °C	0 °C	0 °C
0 °C	0 °C	0 °C	0 °C	0 °C
0 °C	0 °C	0 °C	0 °C	0 °C
5 °C	5 °C	5 °C	5 °C	5 °C
0 Times	0 Times	0 Times	0 Times	0 Times

- "Auto tuning setting"

Set "Automatic backup setting after auto tuning of PID constants" of CH1 and CH2 as shown below.

Item	CH1	CH2	CH3	CH4
Set the auto tuning.				
0:Standard Mode	0:Standard Mode	0:Standard Mode	0:Standard Mode	0:Standard Mode
120 min	120 min	120 min	120 min	120 min
0:Disable	0:Disable	0:Disable	0:Disable	0:Disable
0 °C	0 °C	0 °C	0 °C	0 °C
1:ON	1:ON	0:OFF	0:OFF	0:OFF



Use the default values for the parameters other than the parameters shown above.

■Writing to the CPU module

For the writing to the CPU module, refer to the following.

Page 52 Writing to the CPU module

Auto tuning

For the procedure of auto tuning, refer to the following.

Page 53 Auto tuning

Setting labels

GX Works3 has functions supporting program creation.

The following table lists the module labels and global labels used in these program examples.

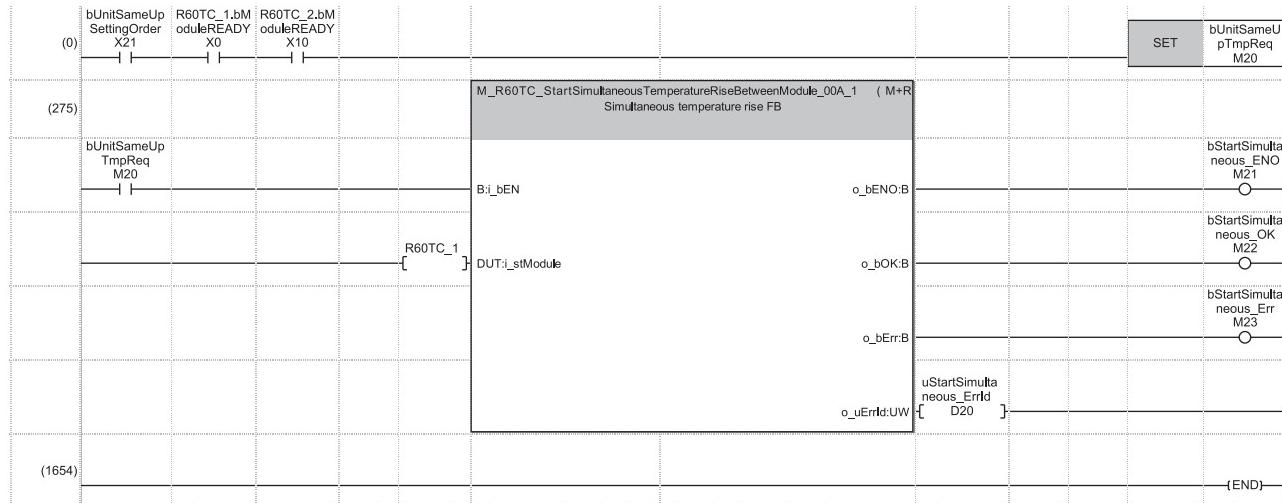
Do not change the settings of the module labels. For details on global labels, refer to the following.

MELSEC iQ-R Programming Manual (Program Design)

Classification	Label name	Description	Device																																			
Module label	R60TC_1.bModuleREADY	Module READY flag	X0																																			
	R60TC_2.bModuleREADY	Module READY flag	X10																																			
Label to be defined	Define global labels as follows.																																					
	<table border="1"> <thead> <tr> <th></th> <th>Label Name</th> <th>Data Type</th> <th>Class</th> <th>Assign (Device/Label)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>bUnitSameUpSettingOrder</td> <td>Bit</td> <td>... VAR_GLOBAL</td> <td>X21</td> </tr> <tr> <td>2</td> <td>bUnitSameUpTmpReq</td> <td>Bit</td> <td>... VAR_GLOBAL</td> <td>M20</td> </tr> <tr> <td>3</td> <td>bStartSimultaneous_ENO</td> <td>Bit</td> <td>... VAR_GLOBAL</td> <td>M21</td> </tr> <tr> <td>4</td> <td>bStartSimultaneous_OK</td> <td>Bit</td> <td>... VAR_GLOBAL</td> <td>M22</td> </tr> <tr> <td>5</td> <td>bStartSimultaneous_Err</td> <td>Bit</td> <td>... VAR_GLOBAL</td> <td>M23</td> </tr> <tr> <td>6</td> <td>uStartSimultaneous_ErrId</td> <td>Word [Unsigned]/Bit String [16-bit]</td> <td>... VAR_GLOBAL</td> <td>D20</td> </tr> </tbody> </table>				Label Name	Data Type	Class	Assign (Device/Label)	1	bUnitSameUpSettingOrder	Bit	... VAR_GLOBAL	X21	2	bUnitSameUpTmpReq	Bit	... VAR_GLOBAL	M20	3	bStartSimultaneous_ENO	Bit	... VAR_GLOBAL	M21	4	bStartSimultaneous_OK	Bit	... VAR_GLOBAL	M22	5	bStartSimultaneous_Err	Bit	... VAR_GLOBAL	M23	6	uStartSimultaneous_ErrId	Word [Unsigned]/Bit String [16-bit]	... VAR_GLOBAL	D20
	Label Name	Data Type	Class	Assign (Device/Label)																																		
1	bUnitSameUpSettingOrder	Bit	... VAR_GLOBAL	X21																																		
2	bUnitSameUpTmpReq	Bit	... VAR_GLOBAL	M20																																		
3	bStartSimultaneous_ENO	Bit	... VAR_GLOBAL	M21																																		
4	bStartSimultaneous_OK	Bit	... VAR_GLOBAL	M22																																		
5	bStartSimultaneous_Err	Bit	... VAR_GLOBAL	M23																																		
6	uStartSimultaneous_ErrId	Word [Unsigned]/Bit String [16-bit]	... VAR_GLOBAL	D20																																		

Program examples

■Program example of the inter-module simultaneous temperature rise



■Program that is processed when the upper limit input alert occurs

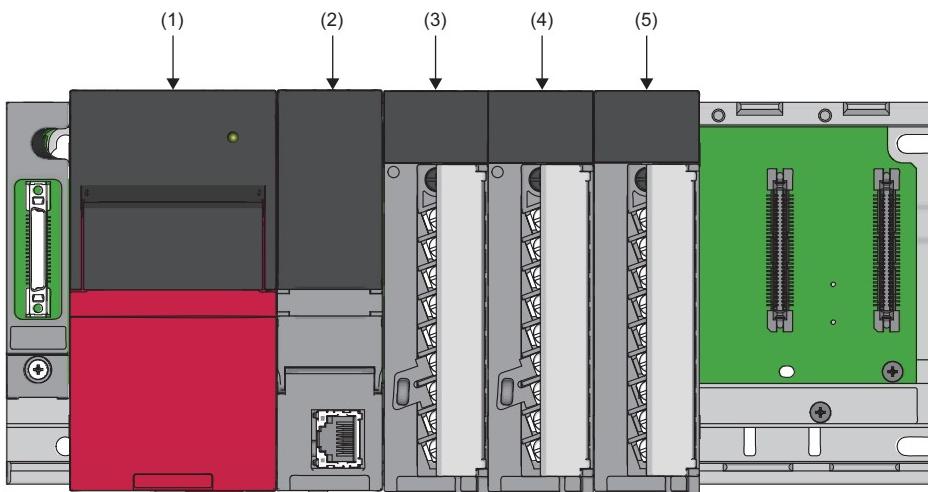
For the program that is processed when the upper limit input alert occurs, refer to the following.

Page 55 Program that processes data when the upper limit input alert occurs

Standard control (When using the inter-module peak current suppression function)

System configuration

The following shows a system configuration example.



- (1) Power supply module (R61P)
- (2) CPU module (R120CPU)
- (3) Temperature control module 1 (R60TCTRT2TT2)
- (4) Temperature control module 2 (R60TCTRT2TT2)
- (5) Input module (RX10)

Parameter settings

Connect an engineering tool to the CPU module and set parameters.



In these program examples, use the default setting for the parameters other than the set parameters. For parameters, refer to the following.

MELSEC iQ-R Temperature Control Module User's Manual (Application)

■Setting modules

For how to set the module, refer to the following.

Page 50 Setting modules

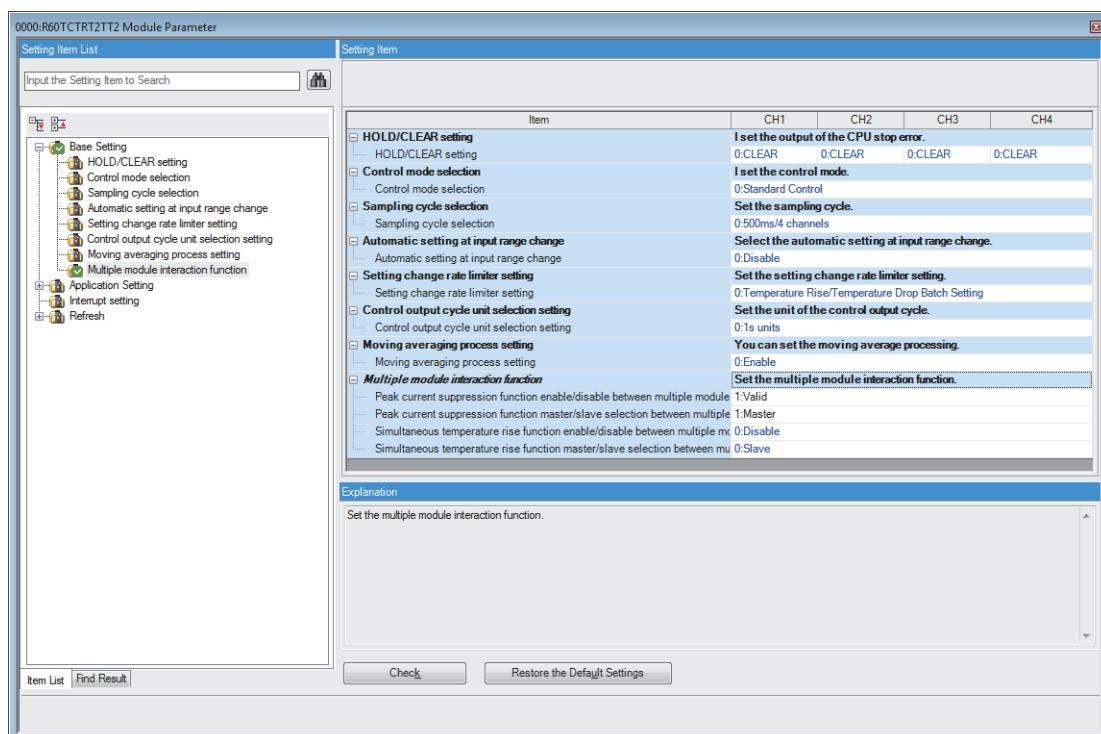
■Setting parameters of the temperature control module 1

1. Configure the settings in "Base Setting" as follows.

☞ [Navigation window] ⇒ [Parameter] ⇒ [Module Information] ⇒ [R60TCTRT2TT2] ⇒ [Module Parameter] ⇒ [Base Setting]

- "Multiple module interaction function"

Set "Peak current suppression function enable/disable between multiple module" and "Peak current suppression function master/slave selection between multiple module" as shown below.



2. Configure the settings in "Application Setting" as follows.

 [Navigation window] \Rightarrow [Parameter] \Rightarrow [Module Information] \Rightarrow [R60TCTRT2TT2] \Rightarrow [Module Parameter] \Rightarrow [Application Setting]

- "Control basic parameters"

Set "Target Value(SV) Setting" of CH1 and CH2, and "Unused channel setting" of CH3 and CH4 as shown below.

Item	CH1	CH2	CH3	CH4
Control basic parameters				
Input range setting	2.Thermocouple K Measured Te 2.Thermocouple K Measured Te	2.Thermocouple K Measured Te 2.Thermocouple K Measured Te	0 °C	0 °C
Target Value(SV) Setting	200 °C	250 °C	0 °C	0 °C
Unused channel setting	0:Used	0:Used	1:Unused	1:Unused
Control output cycle setting	30 s	30 s	30 s	30 s
Control Response Parameters	0:Slow	0:Slow	0:Slow	0:Slow
Stop mode setting	1:Monitor	1:Monitor	1:Monitor	1:Monitor
PID continuation Flag	0:Stop			

- "Limiter setting"

Set "Upper Limit Setting Limiter" of CH1 and CH2 as shown below.

Item	CH1	CH2	CH3	CH4
Limiter setting				
Upper limit output limiter	100.0 %	100.0 %	100.0 %	100.0 %
Lower Limit Output Limiter	0.0 %	0.0 %	0.0 %	0.0 %
Output Change Amount Limiter	0.0 %/s	0.0 %/s	0.0 %/s	0.0 %/s
Upper Limit Setting Limiter	400 °C	500 °C	1300 °C	1300 °C
Lower Limit Setting Limiter	0 °C	0 °C	0 °C	0 °C
Setting change rate limiter	0 °C	0 °C	0 °C	0 °C
Setting change rate limiter (Temperature drop)	0 °C	0 °C	0 °C	0 °C
Setting change rate limiter unit time setting	0 s	0 s	0 s	0 s

- "Peak current suppression setting"

Set "Peak current suppression control group setting" of CH1 and CH2 as shown below.

Item	CH1	CH2	CH3	CH4
Peak current suppression setting	1:Group 1	2:Group 2	0:Not Divided	0:Not Divided

- "Alert setting"

Set "Alert 1 mode setting" and "Alert set value 1" of CH1 and CH2 as shown below.

Item	CH1	CH2	CH3	CH4
Alert setting				
Alert 1 mode setting	1:Upper Limit Input Alert	1:Upper Limit Input Alert	0:Not Warning	0:Not Warning
Alert 2 mode setting	0:Not Warning	0:Not Warning	0:Not Warning	0:Not Warning
Alert 3 mode setting	0:Not Warning	0:Not Warning	0:Not Warning	0:Not Warning
Alert 4 mode setting	0:Not Warning	0:Not Warning	0:Not Warning	0:Not Warning
Alert set value 1	250 °C	300 °C	0 °C	0 °C
Alert set value 2	0 °C	0 °C	0 °C	0 °C
Alert set value 3	0 °C	0 °C	0 °C	0 °C
Alert set value 4	0 °C	0 °C	0 °C	0 °C
Alert dead band setting	5 °C	5 °C	5 °C	5 °C
Number of alert delay	0 Times	0 Times	0 Times	0 Times

- "Auto tuning setting"

Set "Automatic backup setting after auto tuning of PID constants" of CH1 and CH2 as shown below.

Item	CH1	CH2	CH3	CH4
Auto tuning setting				
Auto tuning mode setting	0:Standard Mode	0:Standard Mode	0:Standard Mode	0:Standard Mode
Auto tuning forced termination time setting	120 min	120 min	120 min	120 min
During AT loop disconnection detection function is enabled / disabled	0:Disable	0:Disable	0:Disable	0:Disable
AT Bias	0 °C	0 °C	0 °C	0 °C
Automatic backup setting after auto tuning of PID constants	1:ON	1:ON	0:OFF	0:OFF



Use the default values for the parameters other than the parameters shown above.

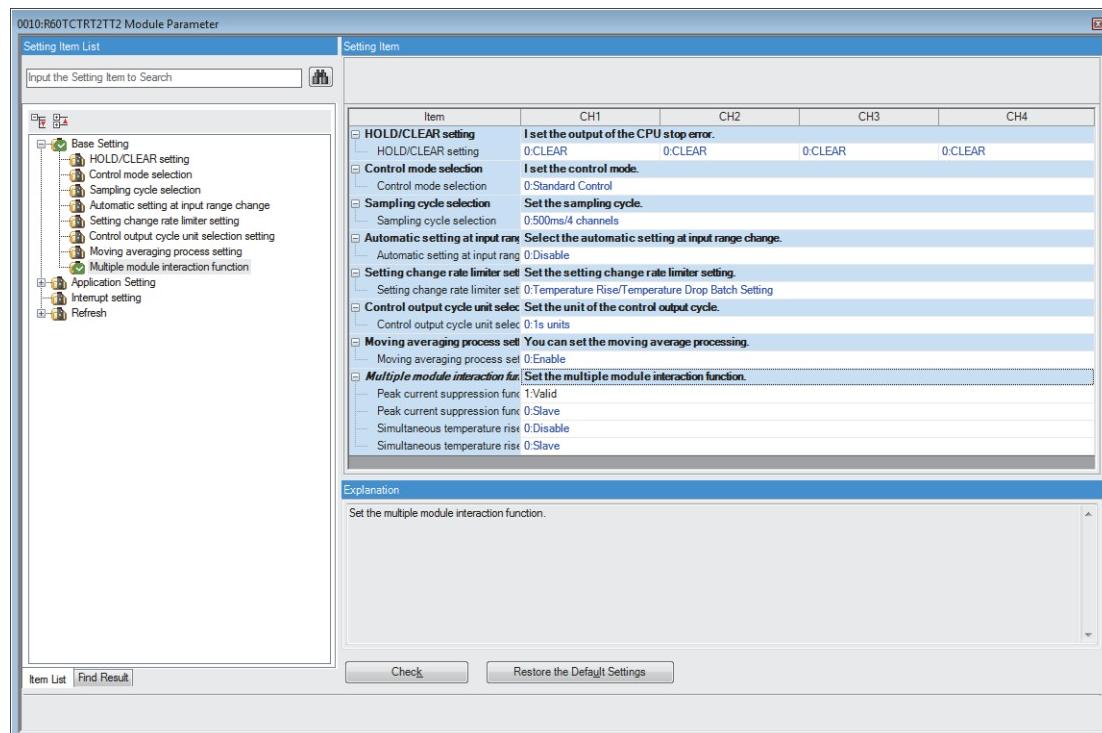
■Setting parameters of the temperature control module 2

1. Configure the settings in "Base Setting" as follows.

☞ [Navigation window] ⇒ [Parameter] ⇒ [Module Information] ⇒ [R60TCTRT2TT2] ⇒ [Module Parameter] ⇒ [Base Setting]

- "Multiple module interaction function"

Set "Peak current suppression function enable/disable between multiple module" as shown below.



2. Configure the settings in "Application Setting" as follows.

[Navigation window] \Rightarrow [Parameter] \Rightarrow [Module Information] \Rightarrow [R60TCTRT2TT2] \Rightarrow [Module Parameter] \Rightarrow [Application Setting]

- "Control basic parameters"

Set "Target Value(SV) Setting" of CH1 and CH2, and "Unused channel setting" of CH3 and CH4 as shown below.

Item	CH1	CH2	CH3	CH4
Control basic parameters				
Input range setting	2.Thermocouple K Measured Te			
Target Value(SV) Setting	150 °C	100 °C	0 °C	0 °C
Unused channel setting	0:Used	0:Used	1:Unused	1:Unused
Control output cycle setting	30 s	30 s	30 s	30 s
Control Response Parameters	0:Slow	0:Slow	0:Slow	0:Slow
Stop mode setting	1:Monitor	1:Monitor	1:Monitor	1:Monitor
PID continuation Flag	0:Stop			

- "Limiter setting"

Set "Upper Limit Setting Limiter" of CH1 and CH2 as shown below.

Item	CH1	CH2	CH3	CH4
Limiter setting				
Upper limit output limiter	100.0 %	100.0 %	100.0 %	100.0 %
Lower Limit Output Limiter	0.0 %	0.0 %	0.0 %	0.0 %
Output Change Amount Limiter	0.0 %/s	0.0 %/s	0.0 %/s	0.0 %/s
Upper Limit Setting Limiter	300 °C	200 °C	1300 °C	1300 °C
Lower Limit Setting Limiter	0 °C	0 °C	0 °C	0 °C
Setting change rate limiter	0 °C	0 °C	0 °C	0 °C
Setting change rate limiter (Temperature drop)	0 °C	0 °C	0 °C	0 °C
Setting change rate limiter unit time setting	0 s	0 s	0 s	0 s

- "Peak current suppression setting"

Set "Peak current suppression control group setting" of CH1 and CH2 as shown below.

Item	CH1	CH2	CH3	CH4
Peak current suppression setting				
Peak current suppression control group setting	3:Group 3	4:Group 4	0:Not Divided	0:Not Divided

- "Alert setting"

Set "Alert 1 mode setting" and "Alert set value 1" of CH1 and CH2 as shown below.

Item	CH1	CH2	CH3	CH4
Alert setting				
Alert 1 mode setting	1:Upper Limit Input Alert	1:Upper Limit Input Alert	0:Not Warning	0:Not Warning
Alert 2 mode setting	0:Not Warning	0:Not Warning	0:Not Warning	0:Not Warning
Alert 3 mode setting	0:Not Warning	0:Not Warning	0:Not Warning	0:Not Warning
Alert 4 mode setting	0:Not Warning	0:Not Warning	0:Not Warning	0:Not Warning
Alert set value 1	200 °C	150 °C	0 °C	0 °C
Alert set value 2	0 °C	0 °C	0 °C	0 °C
Alert set value 3	0 °C	0 °C	0 °C	0 °C
Alert set value 4	0 °C	0 °C	0 °C	0 °C
Alert dead band setting	5 °C	5 °C	5 °C	5 °C
Number of alert delay	0 Times	0 Times	0 Times	0 Times

- "Auto tuning setting"

Set "Automatic backup setting after auto tuning of PID constants" of CH1 and CH2 as shown below.

Item	CH1	CH2	CH3	CH4
Auto tuning setting				
Auto tuning mode setting	0:Standard Mode	0:Standard Mode	0:Standard Mode	0:Standard Mode
Auto tuning forced termination time setting	120 min	120 min	120 min	120 min
During AT loop disconnection detection function is enabled / disabled	0:Disable	0:Disable	0:Disable	0:Disable
AT Bias	0 °C	0 °C	0 °C	0 °C
Automatic backup setting after auto tuning of PID constants	1:ON	1:ON	0:OFF	0:OFF



Use the default values for the parameters other than the parameters shown above.

■Writing to the CPU module

For the writing to the CPU module, refer to the following.

Page 52 Writing to the CPU module

Auto tuning

For the procedure of auto tuning, refer to the following.

Page 53 Auto tuning

Setting labels

GX Works3 has functions supporting program creation.

The following table lists the module labels and global labels used in these program examples.

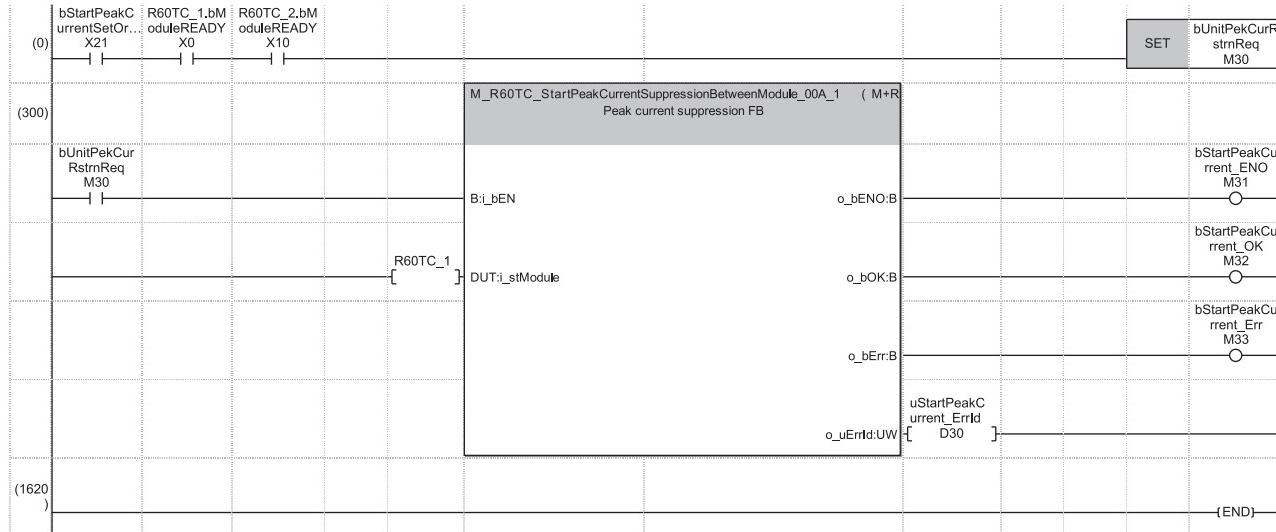
Do not change the settings of the module labels. For details on global labels, refer to the following.

MELSEC iQ-R Programming Manual (Program Design)

Classification	Label name	Description	Device																																			
Module label	R60TC_1.bModuleREADY	Module READY flag	X0																																			
	R60TC_2.bModuleREADY	Module READY flag	X10																																			
Label to be defined	Define global labels as follows.																																					
	<table border="1"> <thead> <tr> <th></th> <th>Label Name</th> <th>Data Type</th> <th>Class</th> <th>Assign (Device/Label)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>bStartPeakCurrentSetOrder</td> <td>Bit</td> <td>VAR_GLOBAL</td> <td>X21</td> </tr> <tr> <td>2</td> <td>bUnitPekCurRstnReq</td> <td>Bit</td> <td>VAR_GLOBAL</td> <td>M30</td> </tr> <tr> <td>3</td> <td>bStartPeakCurrent_ENO</td> <td>Bit</td> <td>VAR_GLOBAL</td> <td>M31</td> </tr> <tr> <td>4</td> <td>bStartPeakCurrent_OK</td> <td>Bit</td> <td>VAR_GLOBAL</td> <td>M32</td> </tr> <tr> <td>5</td> <td>bStartPeakCurrent_Err</td> <td>Bit</td> <td>VAR_GLOBAL</td> <td>M33</td> </tr> <tr> <td>6</td> <td>uStartPeakCurrent_ErrId</td> <td>Word [Unsigned]/Bit String [16-bit]</td> <td>VAR_GLOBAL</td> <td>D30</td> </tr> </tbody> </table>		Label Name	Data Type	Class	Assign (Device/Label)	1	bStartPeakCurrentSetOrder	Bit	VAR_GLOBAL	X21	2	bUnitPekCurRstnReq	Bit	VAR_GLOBAL	M30	3	bStartPeakCurrent_ENO	Bit	VAR_GLOBAL	M31	4	bStartPeakCurrent_OK	Bit	VAR_GLOBAL	M32	5	bStartPeakCurrent_Err	Bit	VAR_GLOBAL	M33	6	uStartPeakCurrent_ErrId	Word [Unsigned]/Bit String [16-bit]	VAR_GLOBAL	D30		
	Label Name	Data Type	Class	Assign (Device/Label)																																		
1	bStartPeakCurrentSetOrder	Bit	VAR_GLOBAL	X21																																		
2	bUnitPekCurRstnReq	Bit	VAR_GLOBAL	M30																																		
3	bStartPeakCurrent_ENO	Bit	VAR_GLOBAL	M31																																		
4	bStartPeakCurrent_OK	Bit	VAR_GLOBAL	M32																																		
5	bStartPeakCurrent_Err	Bit	VAR_GLOBAL	M33																																		
6	uStartPeakCurrent_ErrId	Word [Unsigned]/Bit String [16-bit]	VAR_GLOBAL	D30																																		

Program examples

■Program example of the inter-module peak current suppression



■Program that is processed when the upper limit input alert occurs

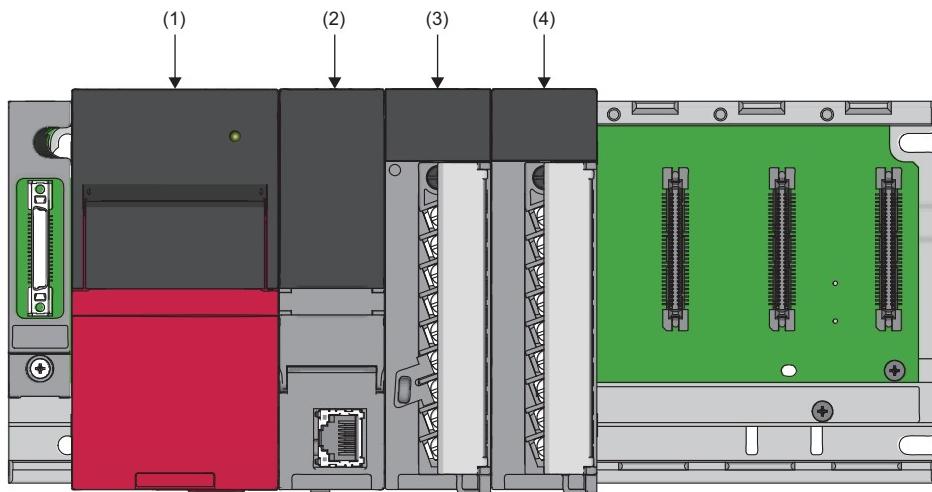
For the program that is processed when the upper limit input alert occurs, refer to the following.

Page 55 Program that processes data when the upper limit input alert occurs

Heating-cooling control

System configuration

The following shows a system configuration example.



- (1) Power supply module (R61P)
- (2) CPU module (R120CPU)
- (3) Temperature control module (R60TCTRT2TT2)
- (4) Input module (RX10)

Parameter settings

Connect an engineering tool to the CPU module and set parameters.



In these program examples, use the default setting for the parameters other than the set parameters. For parameters, refer to the following.

MELSEC iQ-R Temperature Control Module User's Manual (Application)

■Setting modules

For how to set the module, refer to the following.

Page 50 Setting modules

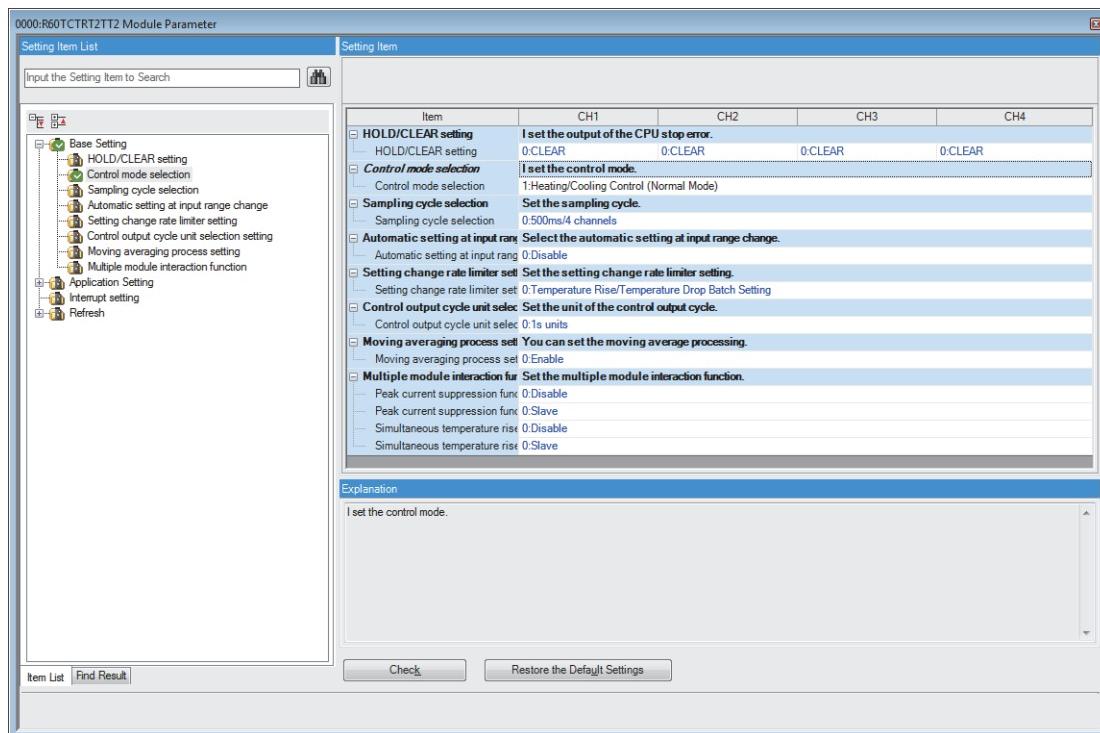
■Setting parameters of the temperature control module

1. Configure the settings in "Base Setting" as follows.

☞ [Navigation window] ⇨ [Parameter] ⇨ [Module Information] ⇨ [R60TCTRT2TT2] ⇨ [Module Parameter] ⇨ [Base Setting]

- "Control mode selection"

Set "Control mode selection" as shown below.



2. Configure the settings in "Application Setting" as follows.

☞ [Navigation window] ⇒ [Parameter] ⇒ [Module Information] ⇒ [R60TCTRT2TT2] ⇒ [Module Parameter] ⇒ [Application Setting]

- "Control basic parameters"

Set "Target Value(SV) Setting" of CH1 and "Unused channel setting" of CH2 as shown below.

Item	CH1	CH2	CH3	CH4
Set the control basic parameters.				
2:Thermocouple K Meas.	2:Thermocouple K Meas.	2:Thermocouple K Meas.	2:Thermocouple K Meas.	
200 °C	0 °C	0 °C	0 °C	
0:Used	1:Unused	0:Used	0:Used	
30 s	30 s	30 s	30 s	
0:Slow	0:Slow	0:Slow	0:Slow	
1:Monitor	1:Monitor	1:Monitor	1:Monitor	
0:Stop				

- "Heating/cooling control setting"

Set "Overlap/dead band setting" of CH1 as shown below.

Item	CH1	CH2	CH3	CH4
Set this when using the heating/cooling control.				
Temperature conversion setting	0:Not Used	0:Not Used	0:Not Used	0:Not Used
Cooling upper limit output limiter	100.0 %	100.0 %	100.0 %	100.0 %
Cooling control output cycle setting	30 s	30 s	30 s	30 s
Cooling method setting	0:Air Cooled	0:Air Cooled	0:Air Cooled	0:Air Cooled
Overlap/dead band setting	-5 °C	0 °C	0 °C	0 °C

- "Alert setting"

Set "Alert 1 mode setting" and "Alert set value 1" of CH1 as shown below.

Item	CH1	CH2	CH3	CH4
Set the temperature process value (PV) or alert status of the deviation.				
1:Upper Limit Input Alert	0:Not Warning	0:Not Warning	0:Not Warning	0:Not Warning
0:Not Warning	0:Not Warning	0:Not Warning	0:Not Warning	0:Not Warning
0:Not Warning	0:Not Warning	0:Not Warning	0:Not Warning	0:Not Warning
0:Not Warning	0:Not Warning	0:Not Warning	0:Not Warning	0:Not Warning
250 °C	0 °C	0 °C	0 °C	0 °C
0 °C	0 °C	0 °C	0 °C	0 °C
0 °C	0 °C	0 °C	0 °C	0 °C
5 °C	5 °C	5 °C	5 °C	5 °C
0 Times	0 Times	0 Times	0 Times	0 Times



Use the default values for the parameters other than the parameters shown above.

■Writing to the CPU module

For the writing to the CPU module, refer to the following.

☞ Page 52 Writing to the CPU module

Auto tuning

For the procedure of auto tuning, refer to the following.

☞ Page 53 Auto tuning

Setting labels

For how to set labels, refer to the following.

☞ Page 54 Setting labels

Program examples

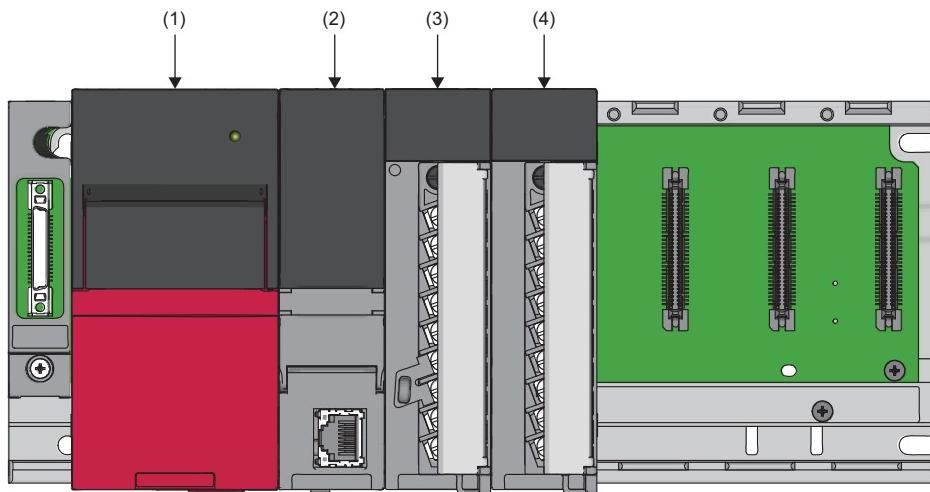
For the program examples, refer to the following.

☞ Page 55 Program examples

Position proportional control

System configuration

The following shows a system configuration example.



- (1) Power supply module (R61P)
- (2) CPU module (R120CPU)
- (3) Temperature control module (R60TCTRT2TT2)
- (4) Input module (RX10)

7

Parameter settings

Connect an engineering tool to the CPU module and set parameters.



In these program examples, use the default setting for the parameters other than the set parameters. For parameters, refer to the following.

MELSEC iQ-R Temperature Control Module User's Manual (Application)

■Setting modules

For how to set the module, refer to the following.

Page 50 Setting modules

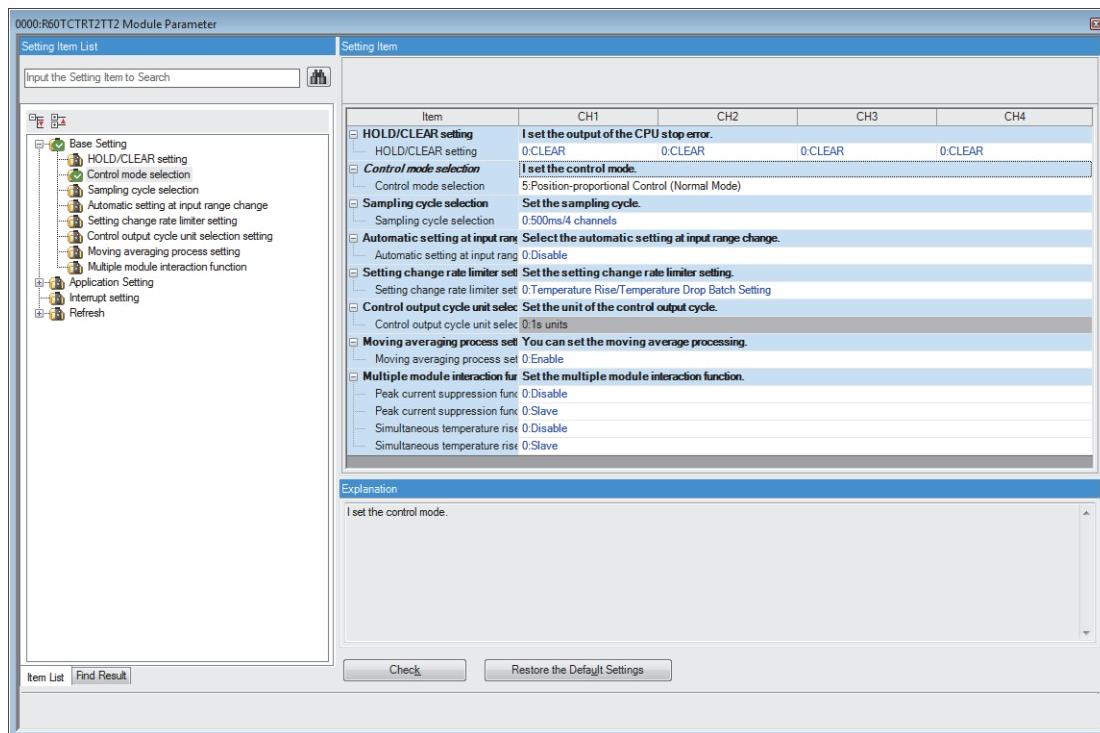
■Setting parameters of the temperature control module

1. Configure the settings in "Base Setting" as follows.

④ [Navigation window] ⇒ [Parameter] ⇒ [Module Information] ⇒ [R60TCTRT2TT2] ⇒ [Module Parameter] ⇒ [Base Setting]

- "Control mode selection"

Set "Control mode selection" as shown below.



2. Configure the settings in "Application Setting" as follows.

☞ [Navigation window] ⇒ [Parameter] ⇒ [Module Information] ⇒ [R60TCTRT2TT2] ⇒ [Module Parameter] ⇒ [Application Setting]

- "Control basic parameters"

Set "Target Value(SV) Setting" of CH1 and "Unused channel setting" of CH2 as shown below.

Item	CH1	CH2	CH3	CH4
Set the control basic parameters.				
Input range setting	2:Thermocouple K Meas.	2:Thermocouple K Meas.	2:Thermocouple K Meas.	2:Thermocouple K Meas.
Target Value(SV) Setting	200 °C	0 °C	0 °C	0 °C
Unused channel setting	0:Used	1:Unused	0:Used	0:Used
Control output cycle setting	30 s	30 s	30 s	30 s
Control Response Parameters	0:Slow	0:Slow	0:Slow	0:Slow
Stop mode setting	1:Monitor	1:Monitor	1:Monitor	1:Monitor
PID continuation Flag	0:Stop			

- "Position-proportional control setting"

Set "Control motor time" and "Addition output limiter setting" as shown below.

Item	CH1	CH2	CH3	CH4
Set this when using the position-proportional control.				
Open/close output neutral setting	2.0 %	2.0 %	2.0 %	2.0 %
Control motor time	1000 s	10 s	10 s	10 s
Addition output limiter setting	100.0 %	150.0 %	150.0 %	150.0 %
Valve operation setting (When CPU stop)	0:Closed-side Output, Ope	0:Closed-side Output, Ope	0:Closed-side Output, Ope	0:Closed-side Output, Ope

- "Alert setting"

Set "Alert 1 mode setting" and "Alert set value 1" of CH1 as shown below.

Item	CH1	CH2	CH3	CH4
Set the temperature process value (PV) or alert status of the deviation.				
Alert 1 mode setting	1:Upper Limit Input Alert	0:Not Warning	0:Not Warning	0:Not Warning
Alert 2 mode setting	0:Not Warning	0:Not Warning	0:Not Warning	0:Not Warning
Alert 3 mode setting	0:Not Warning	0:Not Warning	0:Not Warning	0:Not Warning
Alert 4 mode setting	0:Not Warning	0:Not Warning	0:Not Warning	0:Not Warning
Alert set value 1	250 °C	0 °C	0 °C	0 °C
Alert set value 2	0 °C	0 °C	0 °C	0 °C
Alert set value 3	0 °C	0 °C	0 °C	0 °C
Alert set value 4	0 °C	0 °C	0 °C	0 °C
Alert dead band setting	5 °C	5 °C	5 °C	5 °C
Number of alert delay	0 Times	0 Times	0 Times	0 Times



Use the default values for the parameters other than the parameters shown above.

■Writing to the CPU module

For the writing to the CPU module, refer to the following.

☞ Page 52 Writing to the CPU module

Auto tuning

For the procedure of auto tuning, refer to the following.

☞ Page 53 Auto tuning

Setting labels

For how to set labels, refer to the following.

☞ Page 54 Setting labels

Program examples

For the program examples, refer to the following.

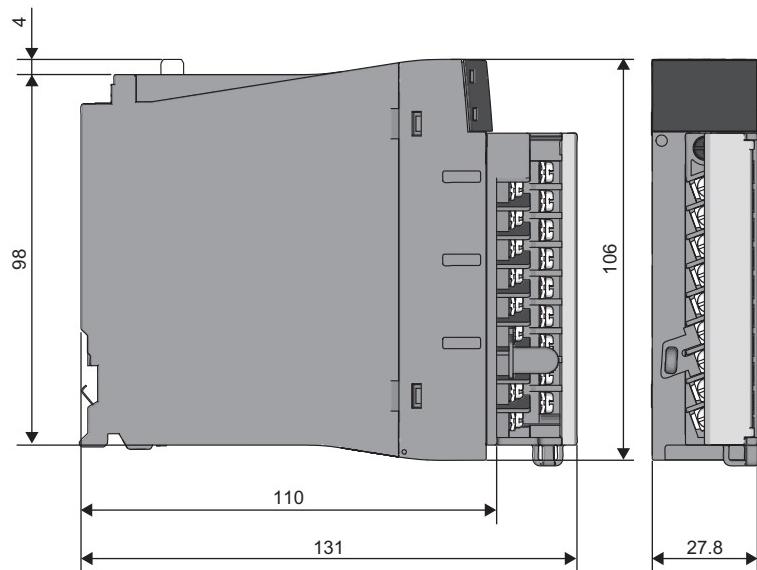
☞ Page 55 Program examples

APPENDIX

Appendix 1 External Dimensions

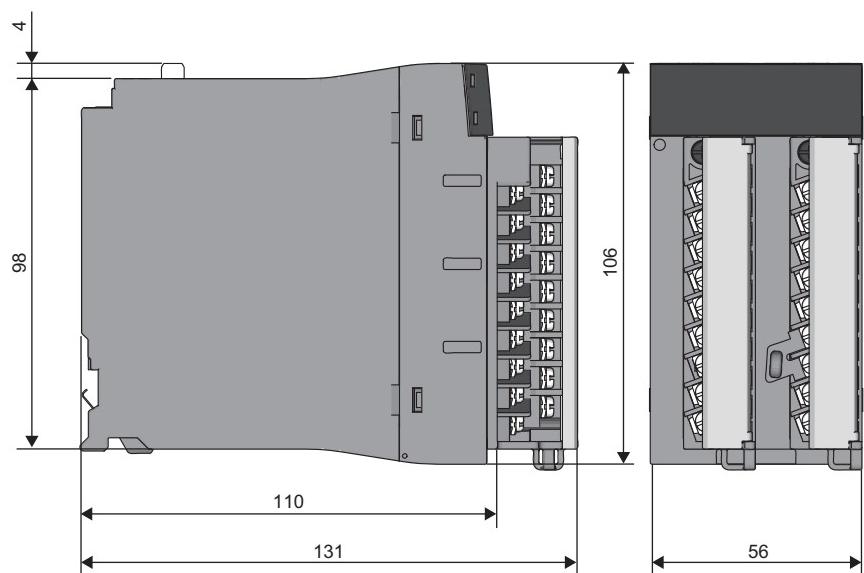
The following shows the external dimensions of the temperature control module.

R60TCTRT2TT2, R60TCRT4



(unit: mm)

R60TCTRT2TT2BW, R60TCRT4BW



(unit: mm)

MEMO

A

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MEMO

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REVISIONS

*The manual number is given on the bottom left of the back cover.

Revision date	*Manual number	Description
July 2015	SH(NA)-081535ENG-A	First edition

Japanese manual number SH-081533-A

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SH(NA)-081535ENG-A(1507)MEE

MODEL: R60TC-U-IN-E

MODEL CODE: 13JX35

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